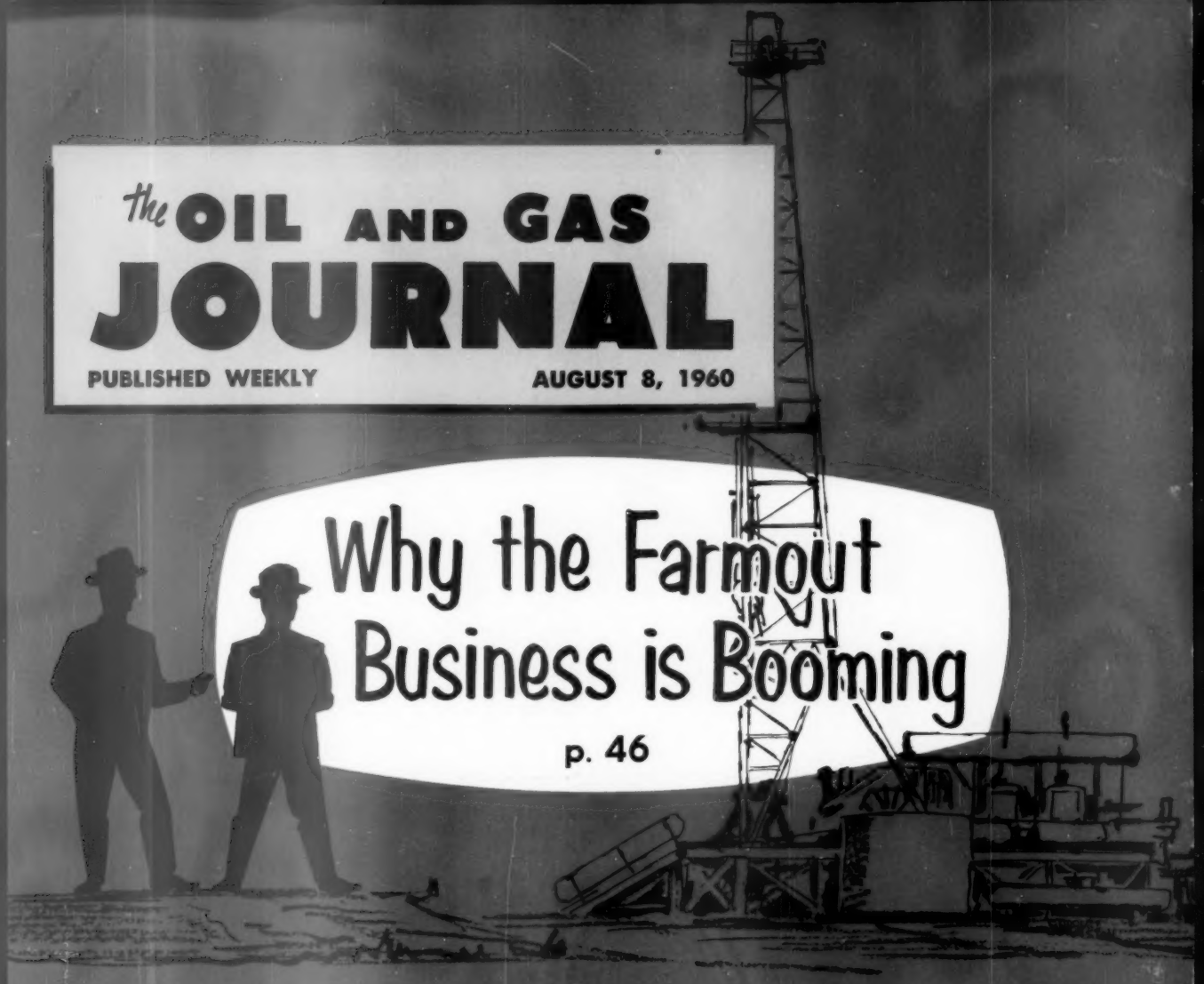
the OIL AND GAS JOURNAL
PUBLISHED WEEKLY AUGUST 8, 1960



Why the Farmout Business is Booming

p. 46

First-half reports show . . .

It's a tough year for making money ▸ 44

Iran brings in a 20,000-bbl. well ▸ 64

Aneth may halt close-spacing arguments ▸ 75

Watch those mixed injection waters ▸ 92

MAXIMUM

hydrocarbon recovery from your gas stream...

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OIL AND GAS JOURNAL
Vol. 58, No. 32

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TECHNOLOGY—OPERATION

Natural Gasoline

How to Design Glycol Dehydrators 71

By Charles R. Perry

Dew-point depression of 75° F. was the practical limit for glycol-dehydration process up to a couple of years ago. Several manufacturers are now making equipment to handle systems requiring depression as much as 100° F.

Petrochemical

American Capital Builds Scottish Chemical Complex 74

By M. Swiss

Union Carbide, Monsanto, and Oronite have provided the capital needed to build the cluster of petrochemical plants around the British Petroleum Co. plant at Grangemouth, Scotland.

Drilling-Production

Utah's Aneth May Halt Close-Spacing Arguments 75

Will the decision of the Utah Oil and Gas Commission limiting spacing at Aneth to 80 acres have an effect on the thinking of those that believe close spacing is desirable? Here are some of the data that convinced the Utah commissioners that 80 acres was close enough.

Turnkey Slim-Hole Jobs Slice Costs for Mississippi Wells 86

By J. W. Arnold

Mississippi operators have found that slim-hole drilling with turnkey contracts can mean real dollars-and-cents savings. Drilling experience since 1954 is covered in this timely report on a fairly recent industry development.

Watch Those Mixed Injection Waters 92

By L. C. Case

Injection of water for secondary recovery or disposal purposes can lead to trouble if the wrong chemicals can get together in the process. Here are a few pointers on what to do to keep your systems trouble-free.

Oil-Well Pumping—9 96

By Joseph Zaba

Role of Torque in Pumping Problems.

Refining-Processing

Unique Cooling Tower Overcomes Ground Fog 78

By Donald R. Baker

Working around a cooling tower in dense fog can stretch your patience. Sinclair solved the problem by building a discharge stack on each fan.

Chemical Cleaning Poses Corrosion Problems 97

By Charles M. Loucks

Chemical cleaners can be labeled "safe" from laboratory tests. But conditions in the field frequently differ from a test-tube environment. Here are some ways to avoid trouble with chemical cleaners.

Cut Evaporation Losses From Storage Tanks 99

By C. A. Basore

Breathing losses from solar radiation can be cut with the use of a heat exchanger to cool the escaping vapors. After cooling, the vapors are returned to the vapor space at the top of the storage tank. This new system operates automatically, handling more vapor as the temperature increases.

Pipelining

Shell Computer Provides Local-Automatic Control 82

By R. D. Pfluger

No communication between the central operator and the pump station is needed when this computer is on the job. It can detect and correct a malfunction before a manual operator would be aware of trouble.

General

They Teach Them How To Tell It 80

By Dr. L. E. Swabb, Jr.

The ability to communicate with superiors and fellow employes is an important factor in the development of a technical man's ability. Here's how Esso's Baton Rouge lab is working communications into their employe-training program.

the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
August 8, 1960

Watch product prices for key to 1960 oil profits:

First-half earnings reports now coming out show profits of many sound oil firms trailing last year.

Reason: Depressed prices for heating oil and gasoline in part of the first half.

Prices improved in June and July—if they hold, prospects are good that company earnings may reach 1959 levels. Many executives are warning, however, that current high refinery runs may upset the delicate demand-supply balance, cause an oversupply of products, ruin prices (p. 44)*.

▼ ▼ ▼

North Texas oil producers have weathered a threatened general crude price cut.

American Petrofina last week restored a 19-cent cut it made last April 9 in its posted price for North Texas crude. The new posting returns the price to $3.01 a barrel in effect prior to the April move.

For a time producers feared the cut would spread over the region, but other buyers failed to follow. In fact another refiner picked up most of the crude at the $3.01 price. The Petrofina move back to the old price naturally won praise from North Texas Oil and Gas Association and TIPRO.

Other price news:

Some Pennsylvania-grade crudes are up 5 to 10 cents. South Penn has posted $4.75 per barrel for Bradford oil in National Transit lines, up 5 cents; $4.80 for Bradford oil in Bradford Transit Lines, up 10 cents; and $4.17 for Penn-grade oil in Eureka line, up 10 cents.

Carter Division of Humble has discontinued posting for Cut Bank crude in Montana and extended the range of its Elk Basin posting to below 21°-gravity.

▼ ▼ ▼

A road that tells drivers to slow down is being tried in California by a subsidiary of California Standard.

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*Refers to article in this issue giving more details. Where no page is given, the item is a Newsletter exclusive.

Researchers have set up a rock-and-plastic "rumble strip" system. It sends sound and vibration warnings through the auto's frame as it passes over patches of the material placed ahead of danger spots.

The object is to see if motorists will slow down for hard-to-see traffic hazards if they get noise warnings.

Nationwide campaign has been launched to impress on American motorists the high tax they pay on gasoline. It will use newspaper, radio, billboard advertising.

Meat of program: Taxes on gasoline now average nearly 10 cents a gallon across the nation. This equals a sales tax of 50%. These high taxes obscure the fact that gasoline remains one of the most economical of all consumer items.

Back of the drive is the Gasoline Tax Education Committee, composed of oil leaders over the nation.

▼ ▼ ▼

Don't be too casual about treating injection waters, an expert advises water-flood engineers (p. 92).

Plugging of pipe, formation, screens, and filters can result from mixing waters containing various elements. The cost of repairing this damage from precipitation can run much higher than cost of treatment.

Fast start has been made by Atlantic Refining on important and unusual miscible flood at Block 9 Wolfcamp pool in West Texas.

More than a third of the 250,000 bbl. of LPG planned was slugged into the reservoir last month. The rest will be slugged by September 1.

Small quantities of gas will be injected starting in mid-August reaching full capacity by October. Water injections will commence in 18 to 20 months (p. 50).

▼ ▼ ▼

A $1.5-million settlement has been reached with the Sid W. Richardson estate for use of solution-washed salt cavities for underground LPG storage.

Oil firms owning 86% of the industry's underground salt storage capacity contributed to the settlement to avoid a long and expensive court battle. Owners of the other capacity have 90 days to contribute and receive immunity from the suit.

Richardson had sued to recover royalties and prevent further use of the washing process on the basis of a patent purchased from a Canadian inventor (p. 45).

Price of anhydrous ammonia has been jumped from $66 to $92 a ton on the West Coast by Collier Carbon & Chemicals, third largest producer in California.

The $26-ton increase has not yet been met by any other

major producer. But even if all the price increase doesn't stick, some observers believe it will tend to prevent further price erosion. The $66-ton price had prevailed on the West Coast since 1958 and is below the U. S. average.

▼ ▼ ▼

An unusual cooling tower which successfully overcomes ground fog has been designed at Sinclair's East Chicago refinery.

It promises to be one of the most successful approaches to this tough fog problem. Major change in the new design is an individual discharge stack for each fan cell.

The individual stacks permit better air flow, prevent downdrafts, and dilute the vapor, thus reducing the density of fog (p. 78).

New way to cut evaporation losses from storage tanks has been developed from recent research with pilot-scale equipment (p. 99).

Here's how it works: As tank pressure rises because of heat, some of the heated air and vapor is discharged from the top. This is circulated through an external heat exchanger. Cooled air and vapors are then returned to the top of the vapor space.

▼ ▼ ▼

Behind the brisk wildcat activity this year is the trend of the majors to grant good farmouts.

High lease rentals and tight drilling budgets have spurred the big companies to let independents take a crack at the leases.

Independents have been snapping up the deals. Often they get better drilling deals in a farmout than by leasing acreage and drilling on their own (p. 46).

Significant wells:

...Alborz 8 is being completed by Iranians as a 20,000-bbl. daily producer from an interval at 10,500 ft. It means that after 9 years of drilling with mixed results, Iran has finally tamed its tiger field into a purring cat (p. 64).

...Wildcat at Brown Creek in West-Central Alberta adds a new name to the growing list of potential gas-producing fields in the Foothills Belt. It's a possible dual producer in the Mississippian (p. 63).

...New producing depth for Oklahoma at 19,654 ft. in the Hunton Siluro-Devonian looms at Ellison 1 Miller-Long unit in Caddo County (p. 58).

...Gulf 2 Marion Osborne, biggest gasser in Texas Panhandle for some time, is a dual producer for Red Deer field in Roberts County. It tested 346,000 M.c.f. daily from the granite wash and lower Pennsylvania conglomerate.

Market Memo

August 8, 1960

Markets are in pretty decent shape.

Gasoline demand is up, and prices are holding at current postings. Refiners are playing a waiting game on middle distillates. Spot crude has tightened considerably.

Current low crude allowables and the December-rate of crude runs in August have crude tight as a drum on the spot market. Two large independents and two majors are hunting additional August crude.

As result of the short supply, Gulf Coast crudes are scarce, and the prices are firming. Spot East Texas crude, multipriced due to prior price weakness, is now firm at the top posted price of $3.25 per barrel.

These firmer price attitudes on crude are spreading to North Texas where Petrofina restored a 19-cent cut and into Oklahoma where the crude market has improved.

The current tight crude market could be the governor to December crude runs in August.

Gulf Coast markets are firm at posted prices. Cargoes of 92-RON gasoline are being sold at 11.25-cent posting with several cargoes available for August lifting. No. 2 is firm and is in an inventory position to warrant a price increase. No. 6 fuel is the tightest product on the Gulf at $2.30 per barrel. Low sulfur No. 6 is $2.55, but not quite as strong due to depressed steel demand.

Group 3 gasoline for northern shipment is very firmly held for low posted price of 12 cents per gallon for 91-RON. A price increase before mid-August for both 91-RON and 99-RON is not improbable.

Chicago gasoline prices are on a firm basis, although some price nibbling persists. The 92-RON at posted 12.625 cents per gallon will likely hold in view of Indiana's recent increase at tank-wagon level.

In spite of little activity on which to test price, the postings of 9.75 cents for No. 1 and 9 cents for No. 2 in Chicago are very firm.

River markets are "in between." Gasoline is priced at Gulf low of 11.25 cents for 92-RON up to one-quarter cent over that figure.

No. 1 and No. 2 are being closely held with a "wait and see" attitude being taken by refiners. Spot barge lots of No. 2 at midriver points are priced at one-quarter to three-eighths cents over Gulf Coast low of 8.25 cents.

Good Wells Make Good News

August 8, 1960

A Report on Profitable "Workover" Treatments by Dowell

Workover treatments of old wells frequently yield more net profit than new wells if treatments are designed for reasonable cost and fast payout. Here are four examples of fast-payout treatments:

- McKenzie County, North Dakota (Old Oil Well) Production from this Madison lime well had declined to 35 bopd. Completion was through perforations from 8500 to 8590 feet. Dowell used the "Acid Guide"* to engineer the following treatment: 7000 gallons of acid-oil emulsion type Retarded Acid were injected down tubing at 5.4 bpm and 2100 psi. Production rose to 133 bopd and the $3101.00 treatment paid out in 23 days.

- Ventura County, California (Old Oil Well) This well had been completed through perforations into the "G" sand from 8174 to 8336 feet. Production had declined to 38 bopd pumping, and re-perforating did not help. Dowell fractured the well using 50,000 gallons lease oil and 40,000 pounds sand. Treatment was down casing at 30 bpm at 4000 psi. After treatment well flowed 500 bopd through casing and declined to 300 bopd before tubing and gas lift valves were installed. Production is now 175 bopd—gas lift. The $5100.00 treatment cost was paid out before tubing was run.

- Grant County, Kansas (Old Gas Well) This well had been producing from the Hugoton series through perforations from 2451 to 2697 feet. Deliverability had decreased to 674 mcfd. Dowell fractured using 100,000 gallons fresh water and 86,200 pounds sand. Injection rate was 57.2 bpm at 500 psi maximum. 490 ball sealers were used during treatment to assure stimulation of less permeable sections. After clean-up, deliverability rose to 2146 mcfd. The operator estimated a 7-month payout on the treatment which is considered excellent for the area.

- Plaquemines Parish, South Louisiana (Old Oil Well) Production from this Miocene well had declined to 38 bopd. The operator wanted to stimulate production, but did not want to go to the expense of moving in a service rig. Dowell acidized through the Christmas tree with 1000 gallons Mud Acid. Treatment cost was only $930.00 and boosted production to 73 bopd. Payout time was 12 days.

If you are caught in a profit squeeze, dial Dowell. A Dowell representative can go over your production picture and propose a program designed to increase your net profit with a minimum investment. Dowell services and products are offered from more than 150 offices and stations in the United States, Canada, Venezuela, Argentina and Germany. Dowell, Tulsa 1, Oklahoma.

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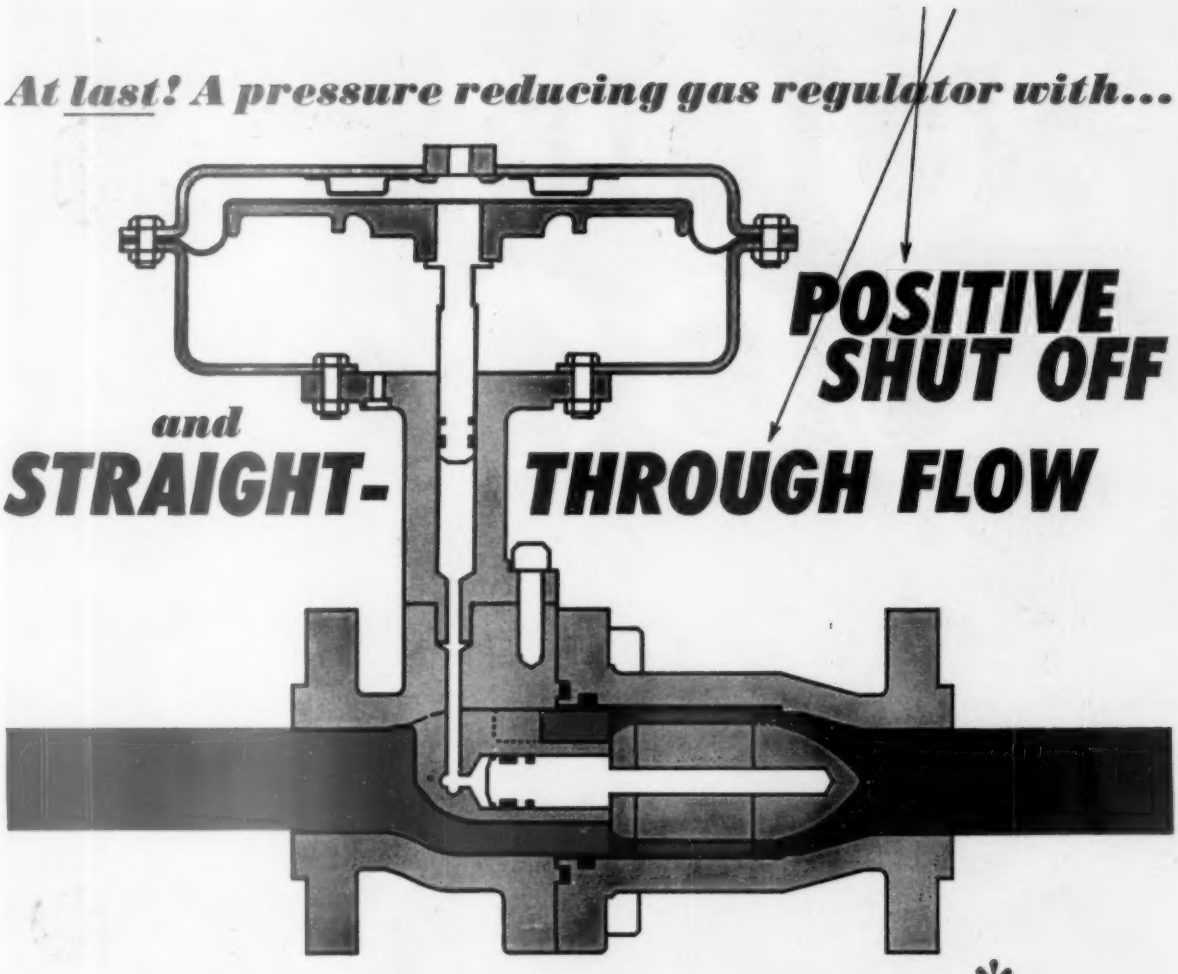

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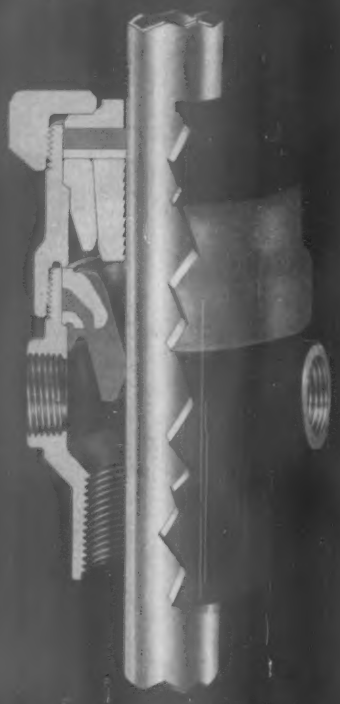

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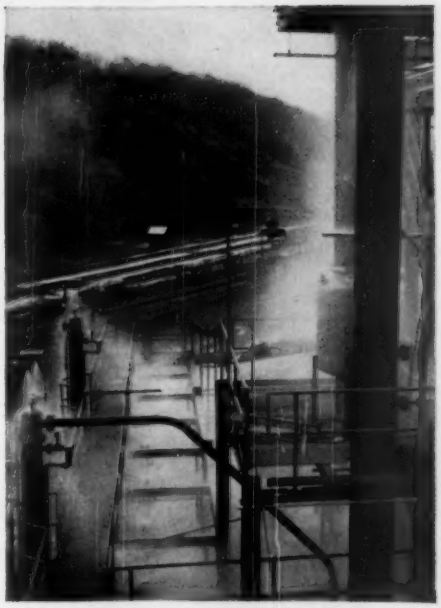

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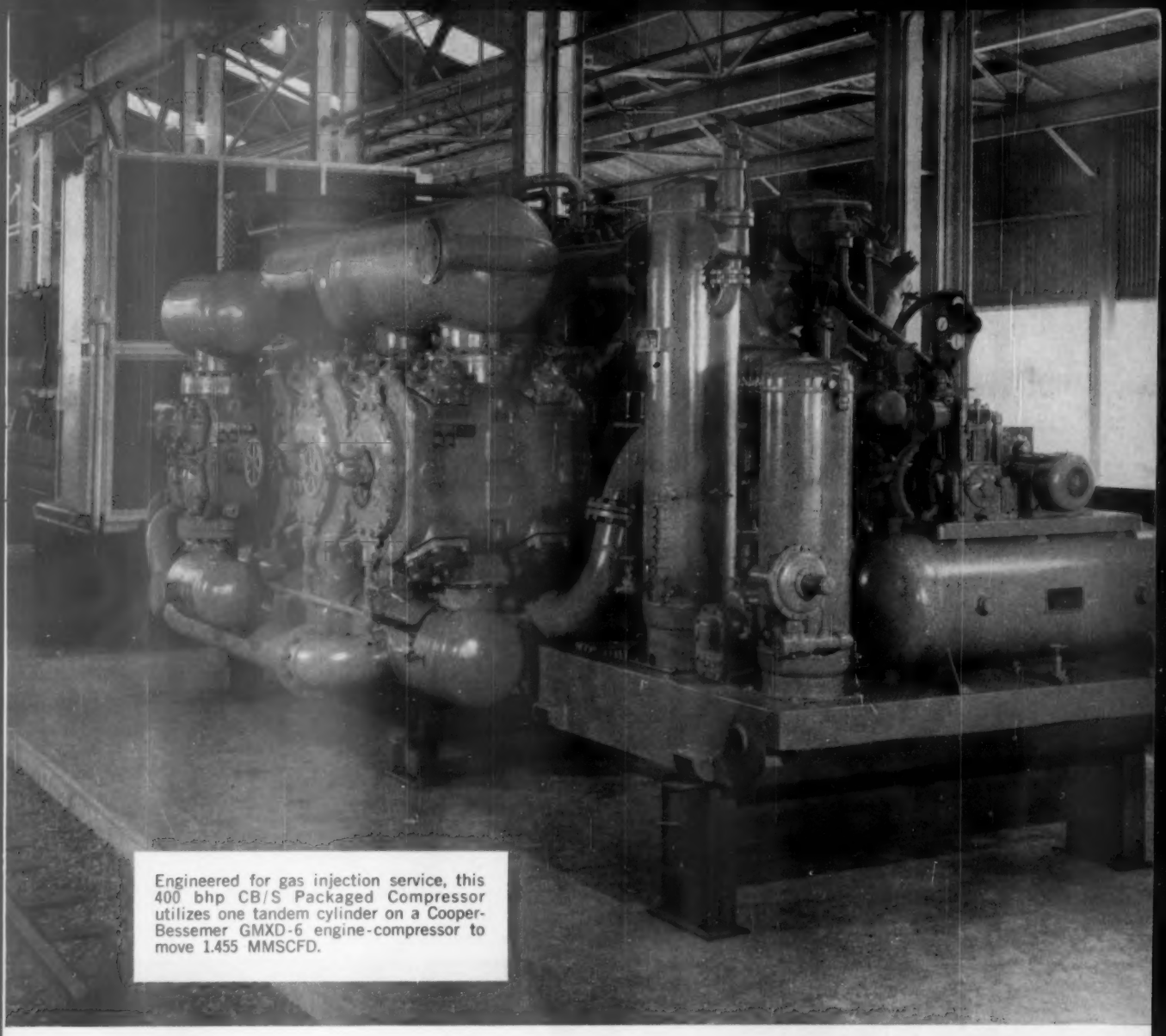

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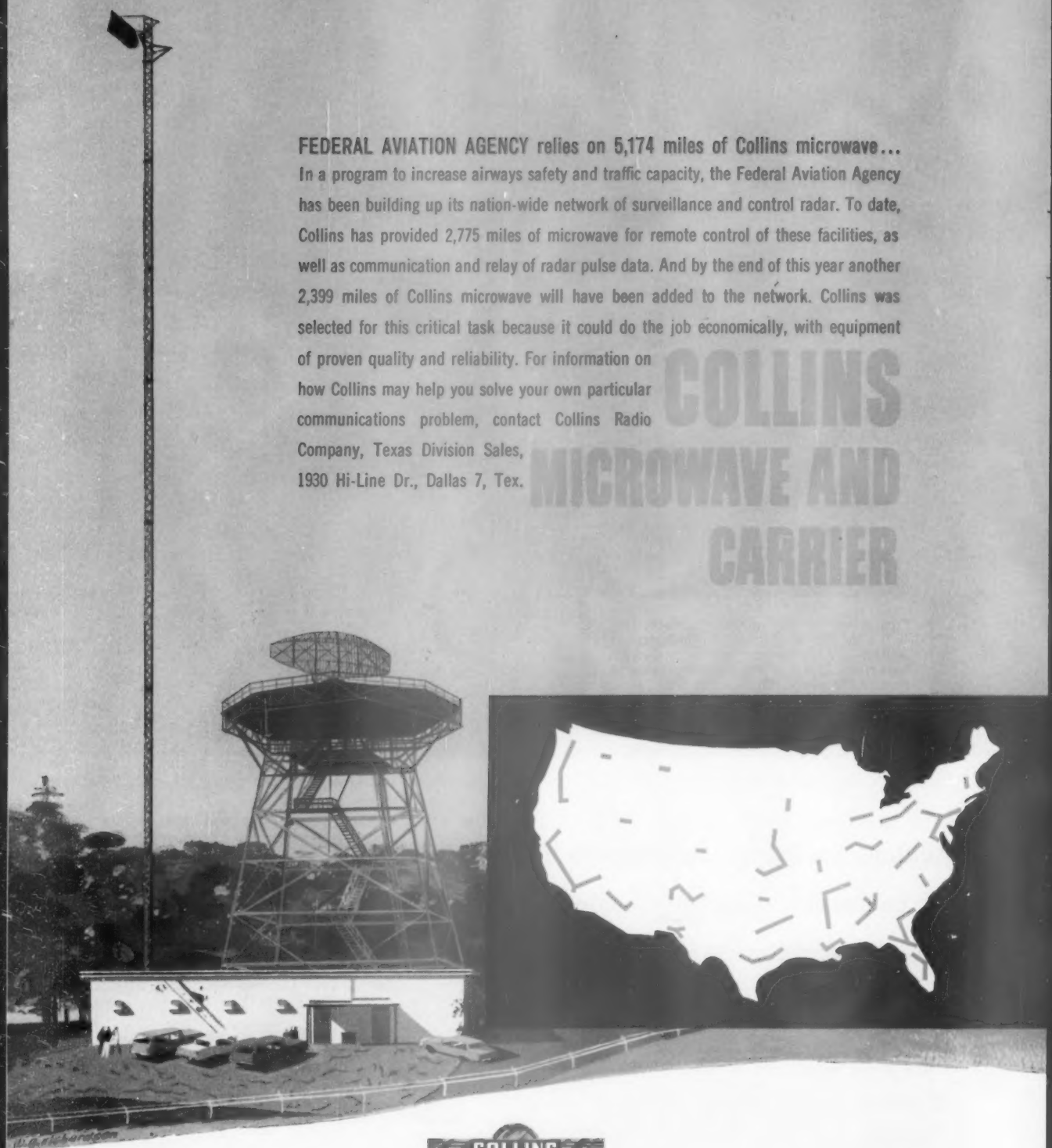

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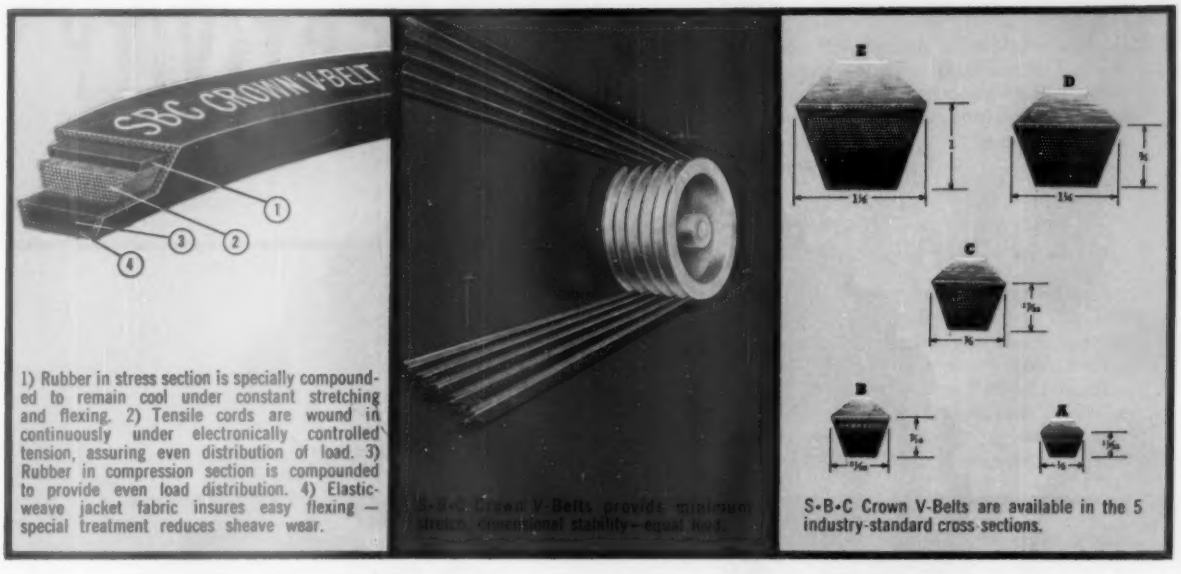

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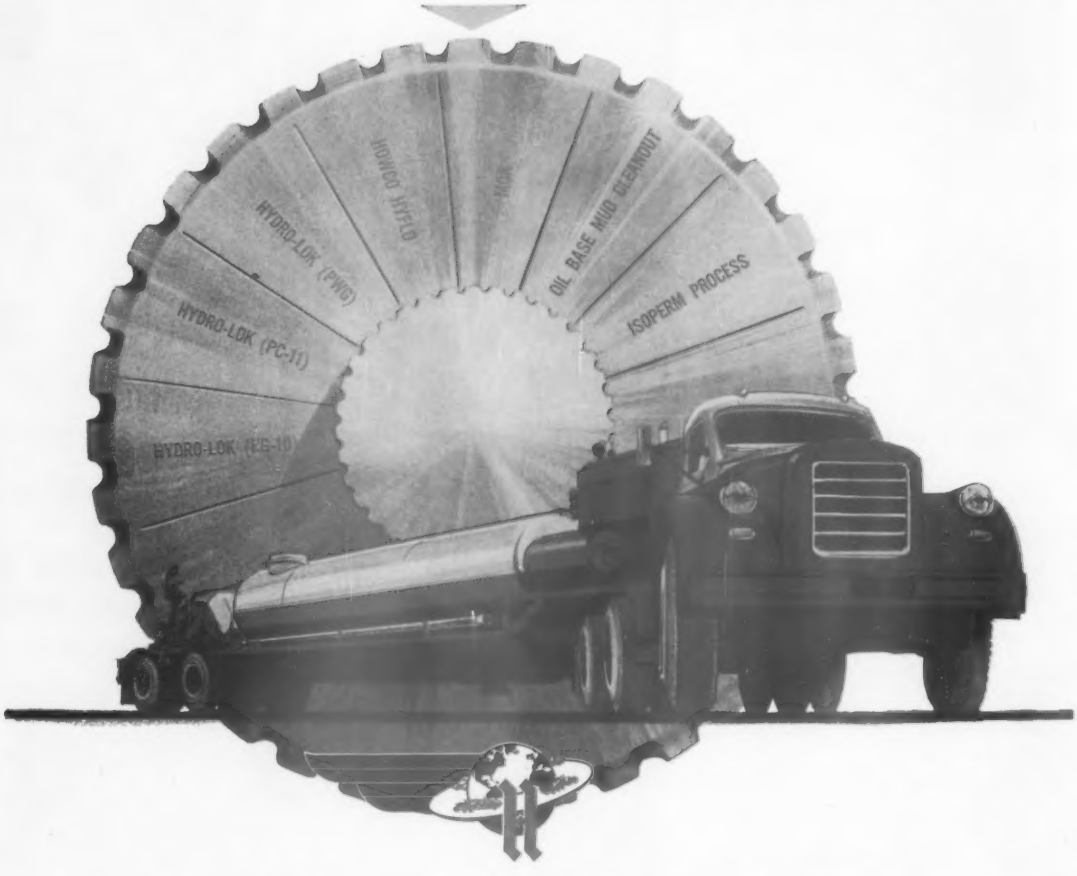

Production stimulation problems are as many and as varied as the formations that cause them. To help you overcome many of these problems with the greatest effectiveness, Halliburton has developed an extensive group of production stimulants. Each is designed to accomplish a certain task *best* in your well to aid you in obtaining maximum production from each formation.

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SURFACTANTS

HOWCO HYFLO ● A surfactant for use in oil designed to help break or prevent emulsions and water blocks. It is particularly effective in helping prevent emulsified obstructions in the formation flow channels resulting from oil base fracturing jobs.

Mud Cleanout Agent (MCA) ● HCL plus Morflo II . . . a mixture designed to aid in restoring damaged permeability. It is particularly effective in shrinking and dispersing water sensitive clays . . . naturally occurring or deposited while drilling . . . also helps destroy water and emulsion blocks.

OIL-BASE MUD CLEANOUT ● Since regular MCA is not effective on all oil-base and oil emulsion type mud cleanout problems, Halliburton has developed a surfactant-oil blend utilizing the excellent dispersing properties of DOC-3 . . . which can also be used on water base muds and for stuck drill pipe. A Howco Hyflo-oil mixture is also an oil base mud removal solution.

WATER CONTROL AGENTS

HYDRO-LOK (PWG) ● PWG is a resin solution designed for helping shut off water bearing formations near the pay zone. Its extremely low viscosity aids in entering the true permeability of the formation before it sets. PWG setting time is very short, once setting begins. It forms a very stiff gel which will withstand considerable formation pressure, but is easy to drill out . . . also a proven pressure grouting chemical for helping control unwanted water in mining and construction operations.

HYDRO-LOK (PC-11) ● PC-11 is a mixture of resins and inert solid materials which form a plastic slurry. It is very effective in controlling water in zones of high permeability, fractured sandstones and limestones. Also, the low viscosity of the resin in the slurry allows the treatment of low permeability formations.

HYDRO-LOK (HG-10) ● This relatively low viscosity resin is recommended where deep penetration in the formation is necessary and a harder set than that obtained with PWG is desired. After setting, HG-10 is insoluble in all known solvents.

ISOPERM PROCESS ● This chemical plugging agent is insoluble in most normal well fluids, but can be removed by a conventional acid treatment. The Isoperm Process is the injection of two chemical solutions that react in the formation. Their reaction forms a gelatinous presipitate which greatly reduces the formation's permeability, but does not plug it completely.

Check with your HALLIBURTON representative about these advanced products!

HALLIBURTON CHEMICAL SERVICES

HALLIBURTON COMPANY • DUNCAN, OKLAHOMA

275 SERVICE CENTERS — JUST MINUTES AWAY FROM YOUR WELL

HERE'S A NEW HOMCO E. W. S.* TOOL

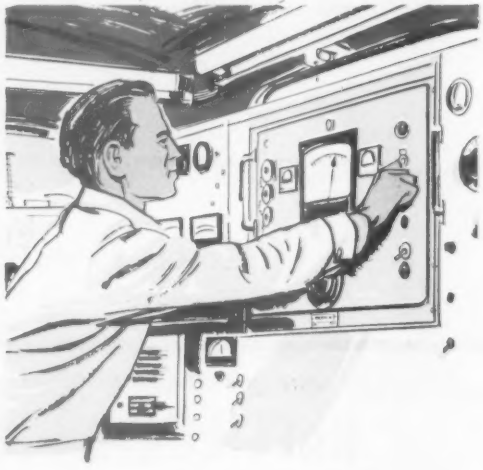
... THE STRESSTECTOR that helps recover more drill collars, tubing and casing ...

The HOMCO "STRESSTECTOR" is a new instrument that provides a means of accurately detecting the free point deep in a long string of heavy drill collars and enables the operator to back off and recover the maximum number of collars.

The new HOMCO "STRESSTECTOR" Free Point Indicator is the smallest instrument of its type available (1⅜" O.D.). It can readily be run through drill pipe or tubing restrictions as small as 1½" in diameter.

The "STRESSTECTOR" is a full functioning unit that is designed to accurately indicate all forms of stress or strain transmitted down the string. HOMCO has designed and perfected a new coil and sensing element and a high temperature oscillator which results in a sub-surface indicator that has much greater sensitivity and resolving power than is available in other instruments. With this instrument the operator may use right or left hand torque, tension, or compression to determine the free point.

* ELECTRONIC WELL SERVICE



NEED THE ANSWER

TO AN ELECTRONIC WELL SERVICE JOB?

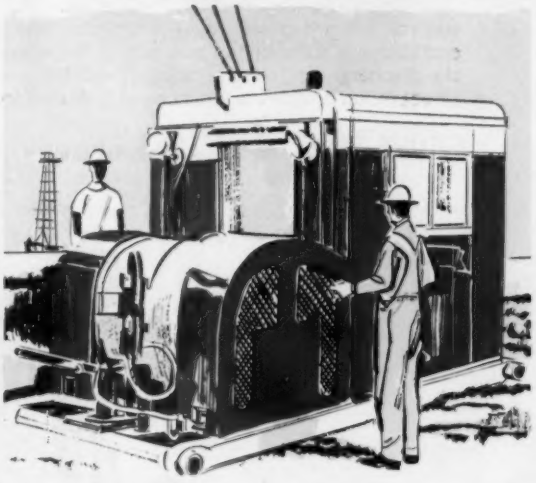
HOMCO HAS IT!

Homco's ELECTRONIC experience, plus its extensive manufacturing plant can provide a wide range of free point indicating equipment for any down-hole condition.

HOMCO
ELECTRONIC WELL SERVICES

HOMCO MOBILE ELECTRONIC WELL SERVICE UNIT.

HOMCO maintains Free Point Indicator and String Shooting trucks at each HOMCO service point throughout the oil country. These completely equipped trucks and experienced crews save hours of valuable rig time. This HOMCO service enables you to locate the free point, back off, and bring the free pipe to the surface in one run of the working string.



HOMCO HYDRAULIC, SKID MOUNTED, ELECTRONIC WELL SERVICE UNIT.

This HOMCO Electronic Well Service Unit provides efficient, portable facilities for performing wire line services that require the use of a single conductor line. The skid unit consists of two parts, the hoisting unit and cab on one skid and the prime mover and hydraulic equipment on the other. Hydraulic hoses, with quick disconnect couplings, connect the units. The weight and depth indicator is integral with the hoisting unit. The yoke on each unit permits choice of balance points for varying loads. The power unit is completely integrated for maximum performance.

HOMCO MODEL 801-B PORTABLE FREE POINT INDICATOR is designed to provide economical Free Point Indicator Service for use in both foreign and domestic fields, offshore service, and inaccessible locations too far distant to be serviced by truck-mounted units but which do have electric wire line service.

HOMCO
ALSO OFFERS

- Fishing & Cutting
- A Complete Supply Service
- Directional Drilling
- Oil Field Rentals
- Fabrication Facilities

HOMCO
ASSOCIATED A OIL FIELD RENTALS

HOUSTON, TEXAS (HEADQUARTERS)

EXPORT OFFICES
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Mexico City, Mexico
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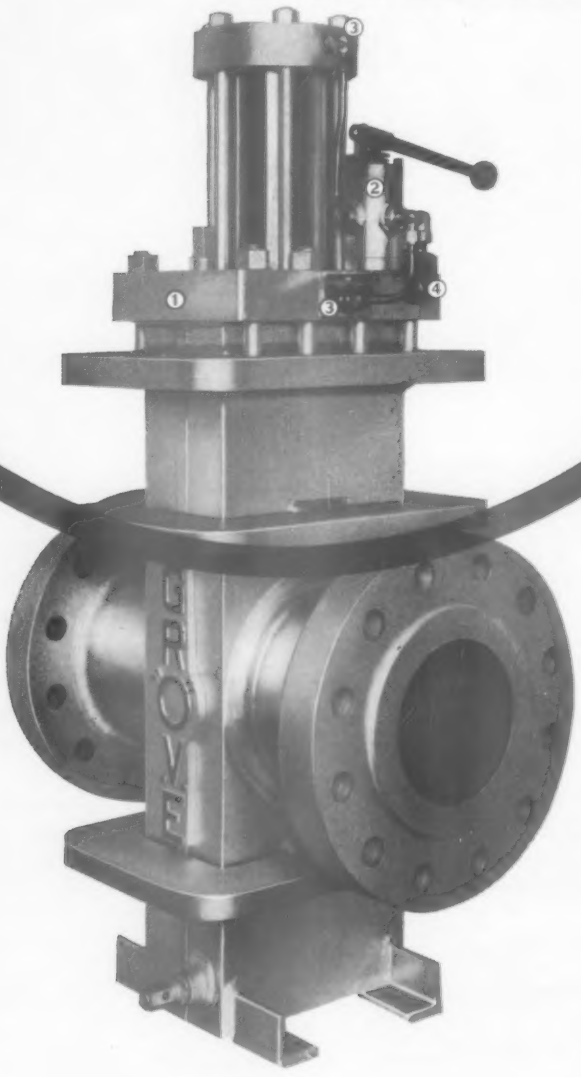
NEW! A GROVE CYLINDER OPERATOR FOR GROVE G-4 VALVES

Now from one source, Seal-"O"-Ring® gate valves with an extremely compact cylinder operator. With fewer parts than conventional units, the operator's reduced size is achieved through designing the valve stem to act also as a piston rod, bringing the cylinder very close to the valve bonnet (1). In some sizes, the valve bonnet actually becomes the lower cylinder head of the operator. The operator comes equipped with a specially designed four-way valve (2) which controls the cylinder. Utilizing line pressure, fluid is applied to either end (3) moving the piston and gate to the open or closed position. A variable orifice (4) in the discharge controls operating speed. Designed for general pipeline service, where ease of operation and/or remote control is necessary.

GROVE PIPELINE VALVES **GROVE VALVE and REGULATOR COMPANY**
a subsidiary of Walworth
8529 Hollis Street, Oakland 8, California
Offices throughout the U.S. and in Western Canada



6731

WECO NO-GALL TOOL JOINT COMPOUND has more than 50% pure metallic zinc dispersed in a neutral oil with a tacky additive.

WECO LO-TORK TOOL JOINT COMPOUND has 50% metallic lead suspended in a neutral base with a tacky additive.

Treat Your Tool Joints to a WECO COMPOUND

WECO Tool Joint Compounds, LO-TORK or NO-GALL, are the treatment your tool joints need for longer life, trouble-free service, easier make-up and break-out. These Compounds meet every requirement for proper and efficient drill string thread lubrication. They provide low-friction make-up; will not squeeze out under high temperature or torque pressure; will not freeze the joint. They always remain soft in the can under all extremes of hot or cold weather for easy, time-saving application. They never require thinning.

WECO Compounds are stocked by Supply Stores everywhere for your convenience.

WECO

WELL EQUIPMENT MFG. CORP.
HOUSTON, TEXAS
Division of CHIKSAN COMPANY *a subsidiary of* FOOD MACHINERY AND CHEMICAL CORPORATION

C-1-60

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WECO UNIONS

CHIKSAN SWIVEL JOINTS

HAMER LINE BLIND VALVES

HAMER PLUG VALVES

WECO AIR-O-UNION

WECO COMPOUNDS

WECO SNATCH BLOCKS

You find Gates Hose where anything flows. Fremont Canyon Tunnel, $14,500,000 project near Casper, Wyoming where more than 22,000 feet of Gates Air Drill and Water Hose have been used. Workmen here are drilling prior to blasting excavation for substructure of powerhouse. Air hose is Gates 18MB Wire Braid Air Drill Hose.

Gates Air Hose delivers on the job "that couldn't be done!"

Industry everywhere uses impressive amounts of air, water, steam, suction and many other hoses in the full range of types and sizes made by Gates.

Back of the world-wide acceptance of Gates Hose is a continuing program of *specialized* hose research at the multi-million dollar Gates Research Center, staffed by more than 200 chemists, physicists and engineers.

It is the aim of this *specialized* research to increase hose utility and life . . . lower Industry's annual hose cost.

Because Gates Hose is so widely preferred, it is quickly available from leading distributors in all industrial centers in the United States and in 90 countries throughout the world . . . and its outstanding performance is guaranteed by the *World's Largest Maker of V-Belts.*

Gates 18MB Wire Braid Air Drill Hose, with oil resistant tube and abrasion resistant cover, gives exceptional performance on all heavy duty air usage under the most severe working conditions. This popular hose — one of many in Gates full line — is always available from your nearby Gates Distributor.

The Mark of *Specialized* Research

The Gates Rubber Company • Denver, Colorado

Gates Rubber of Canada Ltd., Brantford, Ontario

Gates Industrial Hose

Made in a Full Range of Types and Sizes

TPA 459

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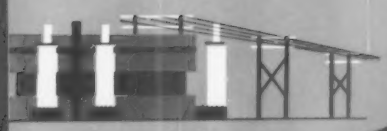
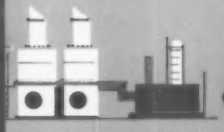


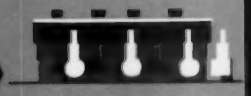
Steam discharge silencers

Jet engine silencers



Heat recovery silencers

MAXIM
AMF BEAIRD
SILENCERS



Industrial engine silencers

Ram Jet Silencers

Marine spark arrestor silencers

Heavy equipment silencers

A vigorous new future for...

TIME PROVEN MAXIM SILENCERS

New relief from a noisy mechanical world is symbolized by the combined AMF-Beaird-Maxim emblem. Now in production at Beaird, Maxim Silencers are the latest to join AMF's industrial family of more than 185 fine products for consumers, industry and defense.

Industrial designers, architects and engineers concerned with noise control will find a new depth in research, engineering and manufacturing facility. AMF's five research laboratories and Beaird's steel fabricating experience in the oil, gas and petrochemical industries assures continuous product improvement.

Qualified sound control engineers at AMF-Beaird-Maxim are ready to work with you on every silencer requirement from ocean going steamers to industrial plants . . . jet engines or even home lawnmowers.

Other Beaird products include packaged compressor plants, pressure storage vessels, LP-Gas and NH3 tanks, trailer transport tankers, cast steel fittings and specialized process vessels.

To put this experienced team on your project . . . contact your nearest Maxim Silencer agent or write direct.

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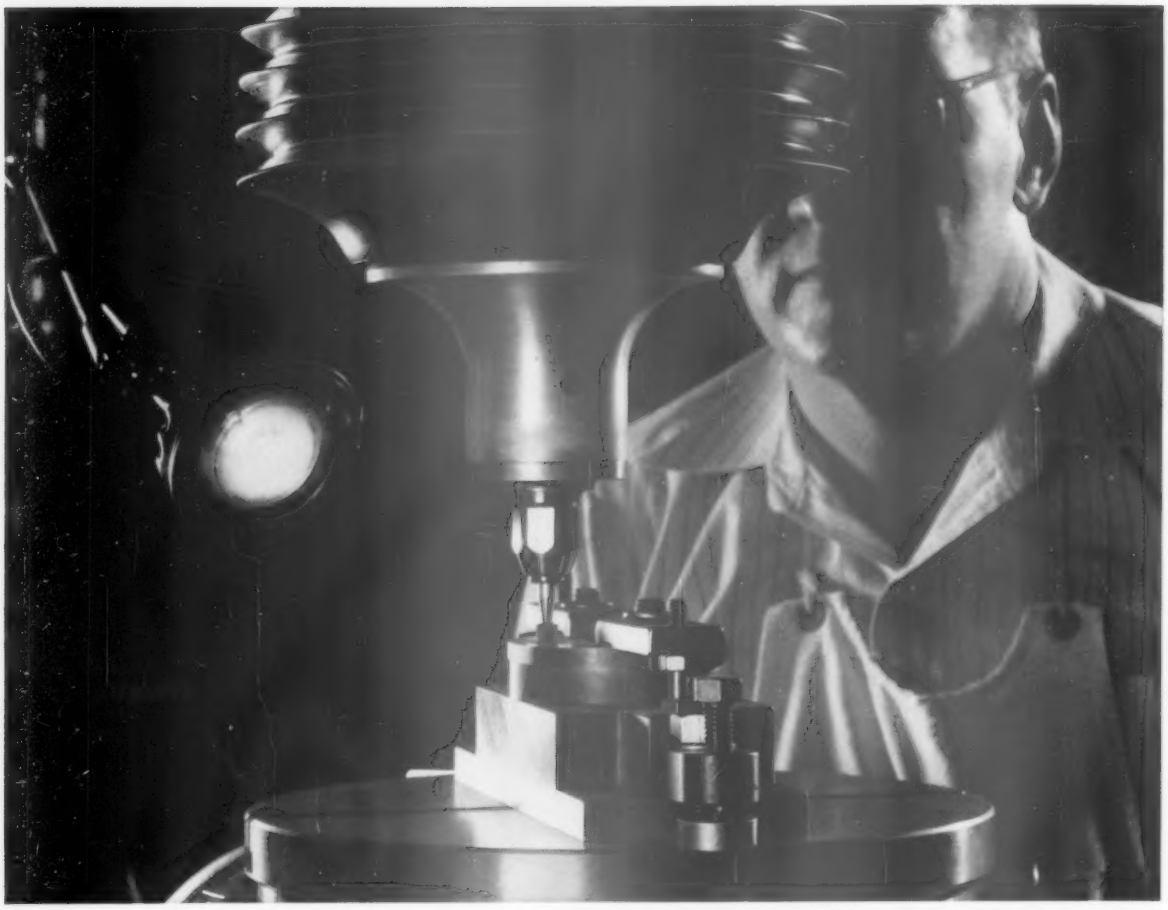
MANUFACTURING PLANTS: Shreveport, Louisiana • Clinton, Iowa



Teletype manufactures for continuous performance

Continuous performance is traditional with Teletype message and data communications equipment. For example, a Teletype Model 28 printer—test-run on a round-the-clock basis at 100 words per minute—operated continuously, hour after hour, for a total of 1,500 hours, printed 9,000,000 words! At the end of this exhaustive test, the machine was still functioning smoothly and steadily.

In maintaining its tradition of quality, Teletype's manufacturing methods play a major role. Specialized machine tools, like the jig grinder shown above, selective heat-treating processes, electronic measuring devices—these are part of a manufacturing technique that insures consistent quality.

When you select Teletype equipment, you can be sure of dependable, trouble-free performance. Teletype Corporation manufactures this equipment for the Bell System and others who require the utmost reliability from their data communications systems.

Typing Tape Punch

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Send-Receive Page Printer

Automatic Send-Receive Set

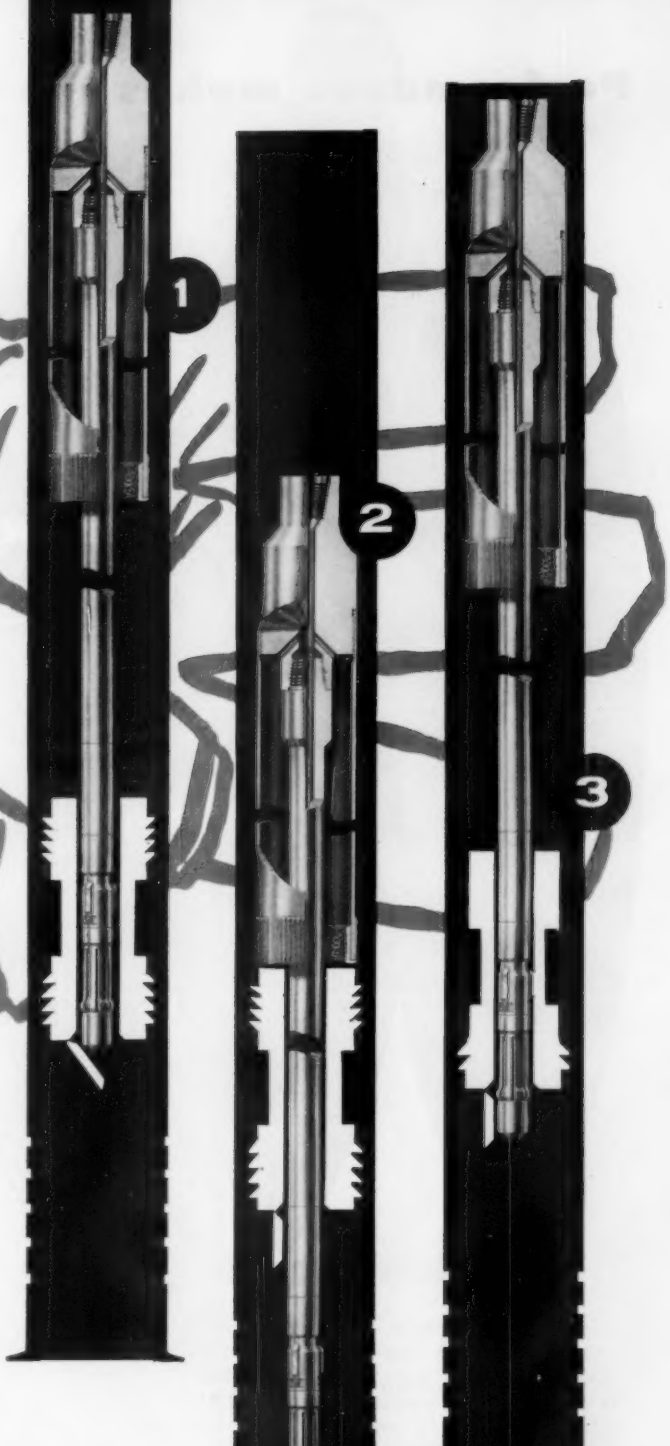
FREE Model 28 line folder. Write Dept. 94H 5555 Touhy Avenue, Skokie, Illinois.

TELETYPE®
CORPORATION
SUBSIDIARY OF *Western Electric Company* INC.

See Teletype Corporation's equipment exhibit at the Western Electronic Show & Convention, August 23-26, Los Angeles, California.

The SAFE-SURE way to retrieve DRILLABLE PRODUCTION PACKERS

the BOWEN PACKER RETRIEVER



It is as simple as one, two, three — and it is the fastest, most reliable, trouble-free method of retrieving packers.

Passes through the bore of the packer in catching position.

Prevents loss of packer during milling.

Pulls the packer after it has been milled over.

One trip does it all—milling, catching, retrieving. The Retriever can be released from the packer if necessary and re-set to catching position — all without coming out of the hole.

Demand the Best
Demand Bowen Packer Retrievers
Complete Brochure available upon request

For over 25 years—the world's leading manufacturer of fishing and specialty tools.

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BOWEN

25th ANNIVERSARY 1935 1960

Performance makes the world of difference

Fig. 6003—Steel gate valve for 600 W.P. Outside screw rising stem and yoke. Bolted flanged bonnet. Flanged ends.

Fig. 3061A—Steel horizontal swing check valve for 300 W.P. Heavily bolted flanged cap. Full unimpeded flow through when wide open.

Fig. 3058—Carbon steel, screwed end lubricated plug valve. ASA 300 pounds. Screwed gland type, wrench operated.

Fig. 2207G—Semi-steel, flanged end, lubricated plug valve for 200 pounds W.O.G. Bolted gland type. Worm gear operated.

In Powell's complete line of valves are STEEL valves for handling fluids in refineries, petrochemical plants and petroleum storage facilities all over the world.

For 100 years Powell valves have served the vital lifelines of the oil industry. Today, the Powell line includes all types of steel, bronze, iron and corrosion resistant valves in sizes to meet every flow control requirement of the wide-spread petroleum world.

Powell can quickly supply all your valve needs and help solve your valve problems. Contact your nearby Powell distributor. (There's one in all major cities.) Or write directly to the Wm. Powell Company.

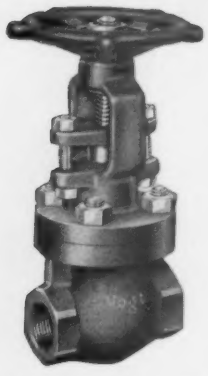
Powell . . . world's largest family of valves

THE WM. POWELL COMPANY • DEPENDABLE VALVES SINCE 1846 • CINCINNATI 22, OHIO

Magcobar
Technology
Gets
YOU
UP

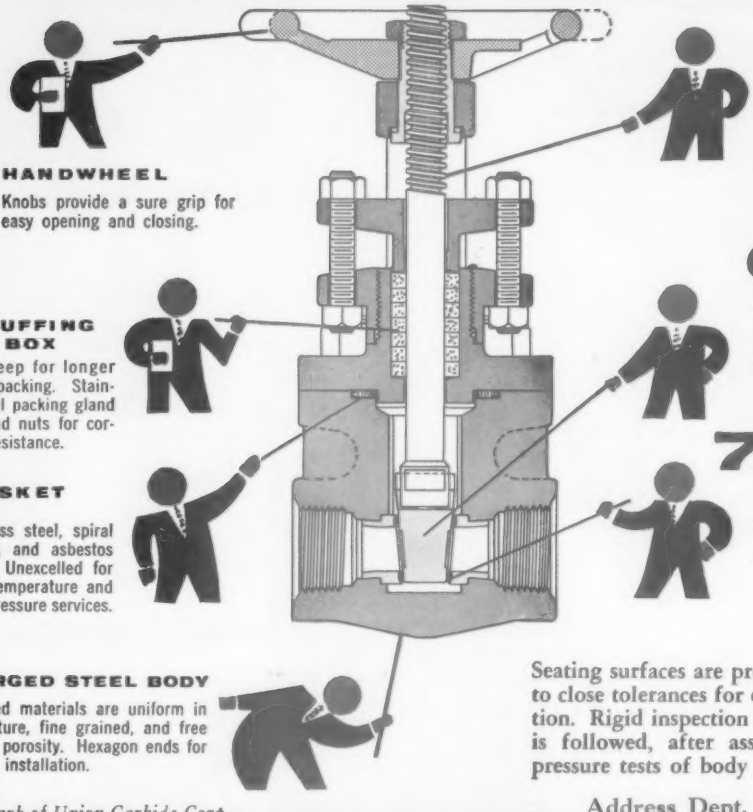
Gets the Hole Down

The shortest distance between two points—spudding in and TD—can be the straight line between the Magcobar planned mud program and drilling economy. If you are responsible for drilling—if it's your well or you're drilling it—you will find that a planned mud program built on Magcobar Technology will help you increase drilling speed and cut drilling cost. Magcobar Technology can be your best assurance of success. It is combination of the right products used right has been proved in every type of drilling around the world. Difficult wells are smoothed out; routine wells are drilled faster and with better production results. You can get to the bottom of most problems by beginning at the top—to plan your wells with the Magcobar mud engineer. He will give you a lift on your way up as the drill goes down.



150-800 POUNDS SERVICE
2000 POUNDS COLD, W.O.G.
SIZES ¼" THRU 2"

A NEW Vogt with 7 superior features



1 HANDWHEEL

Knobs provide a sure grip for easy opening and closing.

2 STUFFING BOX

Extra deep for longer life of packing. Stainless steel packing gland studs and nuts for corrosion resistance.

3 GASKET

Stainless steel, spiral wound, and asbestos filled. Unexcelled for high temperature and high pressure services.

4 FORGED STEEL BODY

Forged materials are uniform in structure, fine grained, and free from porosity. Hexagon ends for easy installation.

5 STEM

13% Chrome stainless steel. A special high melting point alloy yoke nut assures prolonged wear resistance.

6 WEDGE

13% Chrome stainless steel of approximately 500 Brinell for longer wear.

7 SEATS

13% Chrome stainless steel, hard faced with *HAYNES STELLITE or equivalent for stubborn resistance to seat wear.

Seating surfaces are precision machined to close tolerances for drop tight operation. Rigid inspection of finished parts is followed, after assembly, by final pressure tests of body and seats.

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*Trade mark of Union Carbide Corp.

Vogt

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Vogt FOR BETTER VALVES

HENRY VOGT MACHINE COMPANY, Louisville, Ky.

SALES OFFICES: New York, Chicago, Cleveland, Dallas, Camden, N. J., St. Louis, Charleston, W. Va., Cincinnati.

FORGED STEEL

VALVES

A Stearns-Roger built productive plant
of modern concept and efficient operation is based
on your process or flow sheet.
from your flow sheet to operating plant
S-R service comprises DESIGN, ENGINEERING,
PROCUREMENT and CONSTRUCTION, and includes
custom manufacture of any necessary process
equipment. Make this choice—recommended
for continuing satisfaction of operating
management.
If Service must be Reliable, rely on S-R.
Process Engineers for over 70 years
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INTRODUCING Poxyglas™

the ALL-NEW type of tank for handling all corrosive fluids common to Oilfield Production!

- ✓ **Sour Crude**
- ✓ **Salt Water**
- ✓ **Fresh Water**
- ✓ **CO_2**
- ✓ **H_2S**
- ✓ **Treating Chemicals**

Also ideal for areas where *EXTERNAL* corrosion is a problem . . . or where tank weight is a factor!

WHAT IS *Poxyglas?*

POXYGLAS is BS&B's new corrosion-resistant, high strength, light weight glass-resin material that utilizes a filament winding process. Glass filaments are impregnated with epoxy resin and wound in a precisely controlled pattern onto a mandrel. The catalyzed resin is cured at high temperatures to form a strongly bonded, corrosion-resistant material.

BS&B's Filament Winding Method Has These Important Advantages Over Conventional Methods Of Reinforced Plastic Tank Fabrication:

1. **Tank diameters are consistent** because tanks are wound and cured on steel mandrels. No strapping of tanks necessary. Exact volumes of tanks can be calculated.
2. Filament wound structures are *3 to 4 times as strong* as conventional reinforced plastics. Continuous high strength glass filaments carry the load, thus eliminating plastic creep.
3. Completely *controlled glass pattern.* Glass filaments are wound under tension onto a mandrel in a calculated pattern for maximum strength.
4. **Consistent glass-to-resin ratio** is insured by controlled glass impregnation. Every filament is thoroughly covered with epoxy.
5. **Production type operation.** BS&B winding machines have high winding rates with maximum versatility and performance capabilities.
6. **Epoxy-rich inner layer** of the tank eliminates "wicking action", gives a 100% corrosion-resistant inside surface.

PRINTED IN U.S.A.

POXYGLAS tanks are wound on mandrels controlled by a programmed electro-hydraulic servo system developed by BS&B.

This battery of two 12' x 20' POXYGLAS tanks is used to handle corrosive crude.

WHY *Poxyglas*?

Lowest in cost for true corrosion protection....

POXYGLAS combines corrosion-resistant glass and corrosion-resistant epoxy with filament winding to produce a tank that will handle all types of corrosive oilfield service and many chemical plant services where corrosion or product contamination are problems.

Absence of corrosion means low maintenance....

Inspection and recoating costs are eliminated.

POXYGLAS is light weight and has high strength characteristics....

POXYGLAS tanks are approximately one-eighth the weight of a comparable steel tank. Strong, lightweight tanks can be handled with a minimum amount of equipment. Easy to move and reset.

Competitively Priced....

POXYGLAS tanks cost less than redwood tanks, and are competitively priced with welded steel tanks that have been internally coated for corrosion resistance.

POXYGLAS TANK SIZES

Tank No.	Capacity Barrels*	Diameter Feet	Height Feet	Approximate Weight
45-05-001-01	110	10.	8.	900
45-07-001-01	200	12.	10.	1050
45-05-002-01	210	10.	15.	1050
45-05-003-01	280	10.	20.	1350
45-07-002-01	300	12.	15.	1300
45-07-003-01	400	12.	20.	1500

* 42 gallon barrels.

STANDARD FITTINGS AND ACCESSORIES

1 — 4" Gas Equalizer
1 — 4" Fill Line
1 — 4" Vent Line
1 — 4" Drain
1 — 4" Pipe Line
2 — 4" Overflow
1 — 8" TF92G-PB Thief Valve
1 — 18½" x 14" Elliptical Manhole

EFFICIENCY OVER 60 YEARS BS&B RELIABILITY
ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

There's a Place For Poxyglas in Your Operations!

Sour Crude Production • Waterflooding • Subsurface Injection • Offshore Production • Hydrocarbon Recovery • Petro-Chemical Processing • Marketing

For the full story on POXYGLAS tanks, call your BS&B Representative today. Or write to...

BLACK, SIVALLS & BRYSON, INC.

DEPT. 17-A8 P. O. BOX 1714 OKLAHOMA CITY

THE CARDWELL PUMP IS ESTABLISHING ITSELF AS THE OUTSTANDING FACTOR IN BETTER HOLE, FASTER, AND AT LESS COST!

Mr. Geer Wilcox, President
Circle Drilling Company.

"That is our answer when asked about the Pump and its performance!" To explain further, Mr. Wilcox says: "It provides a smooth, even flow of hydraulics . . . we get better bit penetration and longer bit life. • Our engines run smoother, work easier, aren't pulled down. • The V-1500 gives greater horsepower at the bit with less input horsepower. • Even at the highest pressures, there is almost no vibration. • This means longer life for mud lines and other equipment. • Nothing approaches it for sustained operation at high (2800/3200 psi.) pressures. • Its light weight and design cut costs of moving and rig-up. • We have less down time for maintenance since the Pump is so easy to work on. • Our experience shows that Cardwell has licked the critical packing and plunger problems."

Drilling Contractors and Operators, alike, should make it a point to learn of the many benefits gained when the heart of the hydraulics system is a Cardwell Pump!

for tomorrow's equipment—see Cardwell today!

cardwell MANUFACTURING COMPANY, INC.

Box 2001, Wichita, Kansas • Cable: ALLSTEEL • Phone: AMherst 7-3311

OIL KING!

Acknowledged so

by oil men who have used all kinds of gauges

The ten-gallon hat on the Marsh Mastergauge is worn as a crown of acceptance, an emblem of excellence... well earned through years of rugged oil country service.

Just as kings ascend thrones through lineage, the Mastergauge was destined for "royal" acclaim the day it hit the drafting board. Because every product born at Marsh is "born to the purple."

For what other gauge has the Marsh heritage of functional design innovations? Only Marsh offers Conoweld construction, the Marshalloy case, "coined" sector Mastergauge movement, "Recalibrator" adjustment, and optional Safecase protection plus.

That's why we say the *next* great thing that happens in gauges will happen at Marsh.

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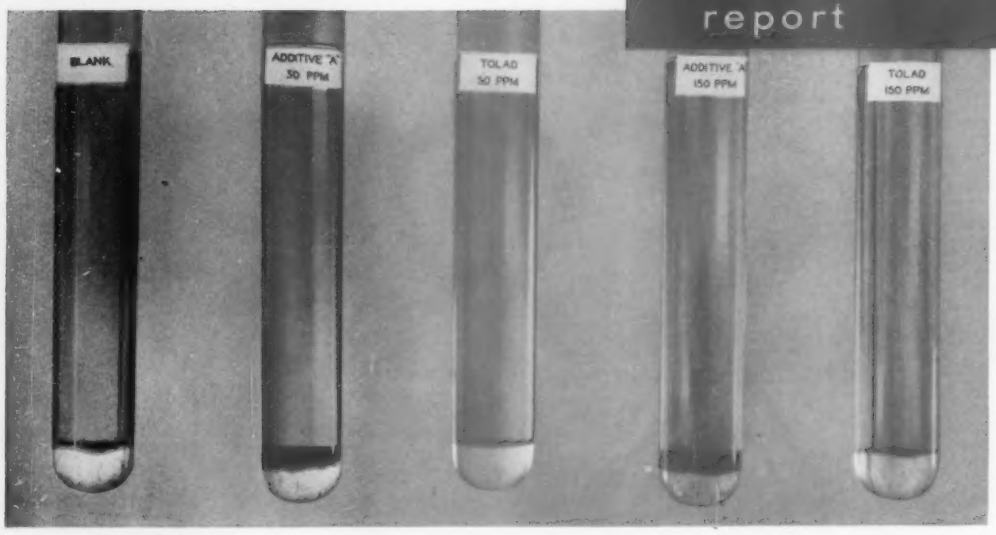
Division of Colorado Oil and Gas Corporation
Marsh Instrument & Valve Co. (Canada) Ltd., 8407 103rd St., Edmonton, Alberta
Houston Branch Plant, 1121 Rothwell St., Sect. 15, Houston, Texas

MARSH GAUGES

In stock at your nearest Supply House

"THE STANDARD OF ACCURACY"

another
TRETOLITE SERVICE
report



TOLAD* *Fuel Additive maintains maximum water tolerance*

Compare the quantities of sludge in the test tubes. The TOLAD-treated fuel samples show much less sludge than the samples treated with a well-known competitive additive.

In the Tretolite Company research laboratories TOLAD Fuel Additives are continually compared with other commercial fuel additives. In test after test, fuels treated with TOLAD have had superior water tolerance.

WHY IS WATER TOLERANCE IMPORTANT?

When agitated, No. 2 fuel oils and diesel fuels form sludge if they contain water and insoluble residue. Some additives actually impair water tolerance.

HOW DO FUEL ADDITIVES AFFECT WATER TOLERANCE?

Additives which are primarily dispersants allow insoluble residue to form freely, but disperse it throughout the fuel. However, they also disperse any water which the fuel may contain, thus promoting emulsification, and eventually, sludge formation.

WHY DO TOLAD ADDITIVES MAINTAIN MAXIMUM WATER TOLERANCE?

TOLAD additives are primarily *inhibitors.* The normal water tolerance of the fuel is not impaired, and the residue problem is corrected by inhibition, rather than dispersion.

The use of TOLAD additives enhances marketability, and practically eliminates burner-tip fouling and filter plugging. In diesel fuel injection systems, TOLAD treatment prevents fouling, increases nozzle life.

In commercial application, TOLAD *has provided these advantages at costs under those of the additives it replaced.*

For information on TOLAD, or test arrangements for your fuel, write or call . . .

FA-60-B

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At Public Service Electric and Gas Co., Sewaren, N. J.

Bitumastic coatings resist 11 years of abrasive salt-water attack

Loading docks of Public Service Electric and Gas Company's Sewaren Generating Station are subjected to unusual corrosive attack by the Arthur Kill, a bay-like tidal river between New York and Staten Island. Added to the river's salt water content are floating debris and effluent from industries and oil refineries located along its shores.

To cope with these severe corrosive elements, 11 years ago Public Service's engineers specified that the steel piling for the station's loading docks and sea wall be coated with Bitumastic® No. 50. For added weathering protection, piling exposed above the low-tide level also was given an additional coating of Bituplastic® No. 28.

FOLLOWING 11 YEARS OF EXPOSURE, PUBLIC SERVICE'S ENGINEERS REPORT NO MAJOR RECONDITIONING OF THE PILING HAS BEEN NECESSARY. This utility's experience is not unique: four other installations fronting the Arthur Kill have had similar success with Bitumastic coatings on submerged piling.

The Bitumastic line includes a coating for every industrial corrosion problem. For on-the-job assistance to keep your corrosion costs down, call your nearby Bitumastic distributor or return the coupon. Koppers Company, Inc., Tar Products Division, Pittsburgh 19, Pa. District Offices: Boston, Chicago, Los Angeles, Pittsburgh, New York and Woodward (Birmingham), Ala. In Canada: Koppers Products Ltd., Toronto, Ont.

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COATINGS & ENAMELS
another fine product of COAL TAR

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Koppers Company, Inc., Tar Products Division
Dept. 104H, Pittsburgh 19, Pa.

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Yes, I'd like to know more about Bitumastic Coatings for Corrosion Prevention.

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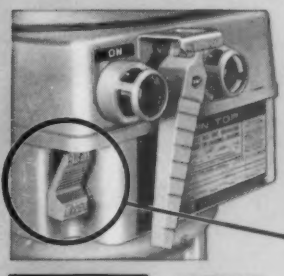
DAMAGE-RESISTING Acme threads. If you've struggled with "banged-up" threads, you'll appreciate this feature. It's always a breeze to put on and take off tanks for installation, inspection or maintenance.

FULL WEATHER PROTECTION - Male threads on collar engage female threads on tank—no external threads to be damaged.

NEW! ***CONTROL TRANSFORMER*** can be mounted in collar. No special-length tanks required.

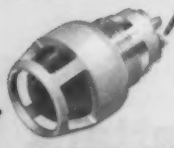
INCREASED WIRING SPACE - Four conduit openings standard, with through-feed conduit entrances for horizontal tap-offs optional.



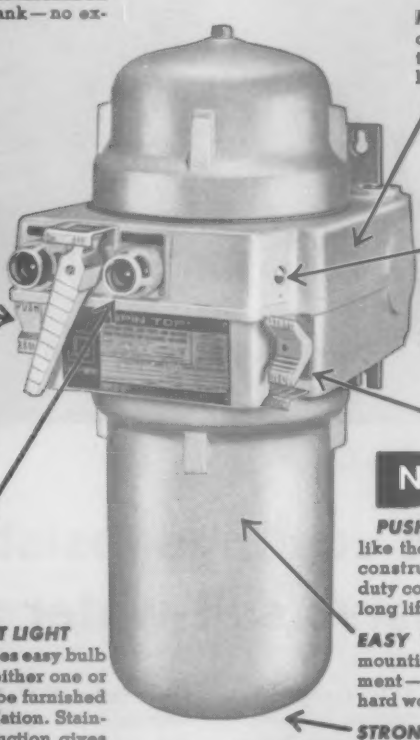
NEW! ***SELECTOR SWITCH*** is made in one piece, installs simply by threading into opening provided in enclosure. One-piece construction permits pre-testing before shipment.

NEW! ***RECESSED CONTROL STATIONS*** like the reset button are out of the way, have no protrusion to break or bend accidentally.

NEW! ***PUSHBUTTON,*** like the selector switch, features one-piece construction for easy installation. Heavy-duty contacts and rugged mechanism assure long life.



NEW! ***BRILLIANT PILOT LIGHT*** is visible from all angles and provides easy bulb change. Enclosure available with either one or two factory-mounted lights or can be furnished with plugged holes for field installation. Stainless steel thread-in-thread construction gives corrosion-resistance and easy servicing.



EASY TO INSTALL with *slide and hook* mounting arrangement for interior equipment—a Square D "exclusive." Takes the hard work out of the installation job.

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4 ENCLOSURE SIZES ACCOMMODATE NEMA SIZES 0 THROUGH 5

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Write for Bulletin 9990. Square D Company, 4041 North Richards Street, Milwaukee 12, Wisconsin

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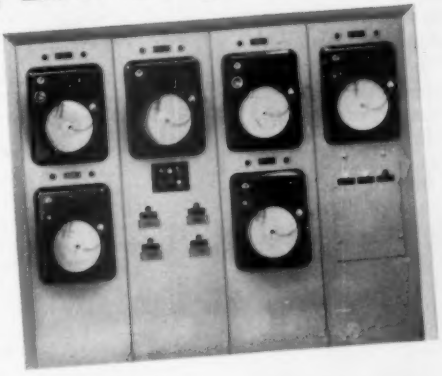

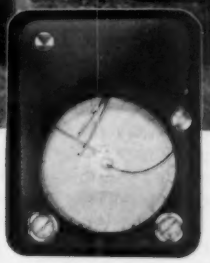

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"Impressive evidence abounds concerning the extent to which rising wage costs are pricing American manufactured goods out of world markets.

"For obvious reasons this evidence is distasteful to the leaders of organized labor. They prefer to ignore it or deny it. To acknowledge it would be to acknowledge also that repeated wage increases entail a point of diminishing returns for the union rank and file.

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Editorial in the Daily Oklahoman.

Coal's suspect motives

"The coal industry, confessing its inability to match the advantages of its rival fuels, has turned to Congress to force its product on the public. Oddly enough, allied with it in this effort are railroads which turned from coal to oil . . . and now seek to deprive other consumers of the economic advantages which saved some of these railroads from possible bankruptcy.

"Leaders of the petroleum and natural gas industries, responding to the move for government action, have made it clear that they have no objection to a national study in regard to fuel resources.

"What they do object to is a study inspired by selfish interest with the purpose of smashing American traditions, ending free competition, and depriving the American consumer of his right to decide what product will best serve his needs."

Article in the July issue of Service, magazine of Cities Service Co.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

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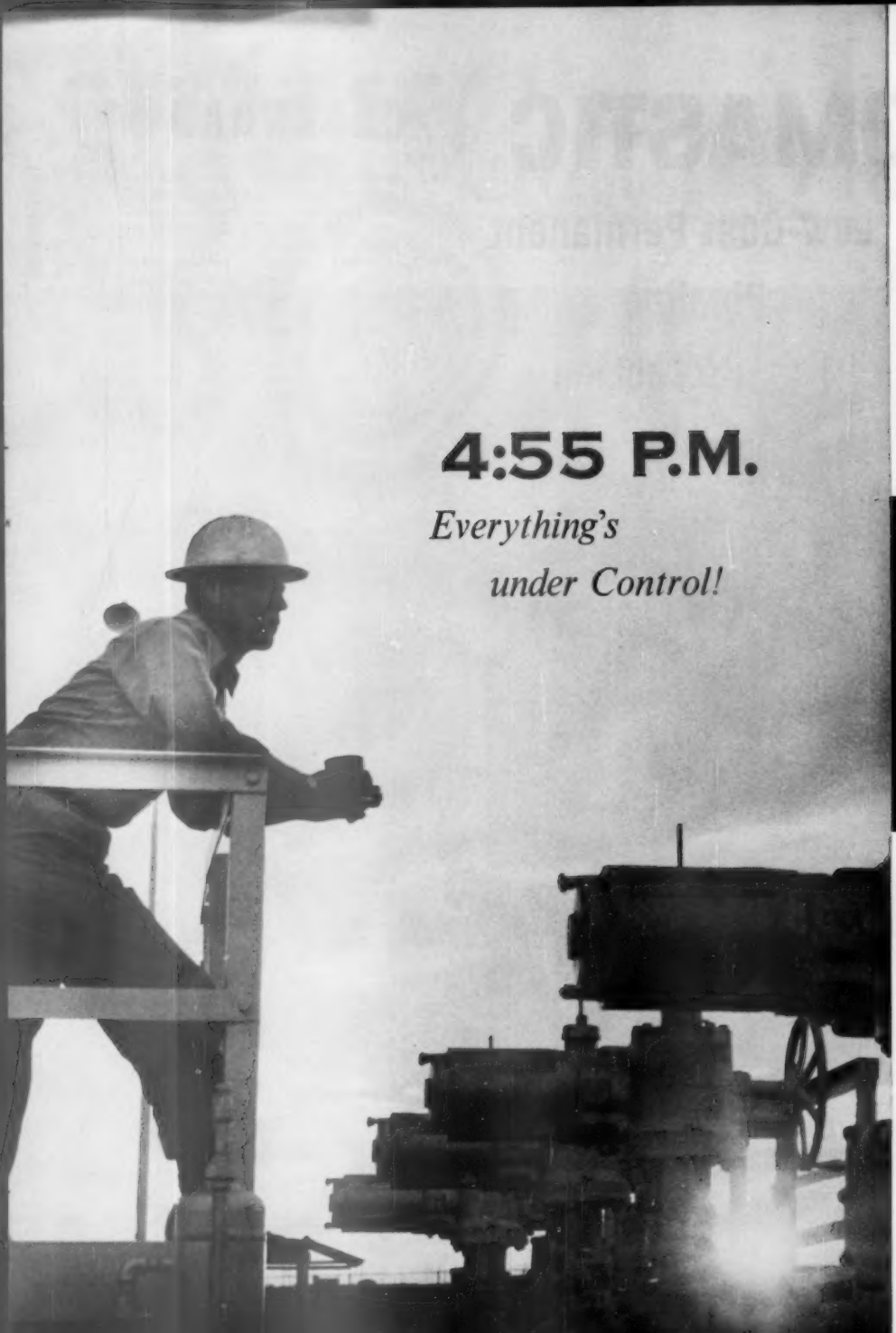

4:55 P.M.

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In five minutes the only maintenance man at this remote pipeline pumping station will leave for the weekend. Everything's under control. On unattended automatic equipment . . . wherever expensive rotating and reciprocating machinery deserves 'round-the-clock malfunction protection . . . specify Vibraswitch. Electrical and pneumatic signaling models that react instantly to changes in acceleration of machinery vibration . . . shutting down, alarming, activating standbys. When will your expensive machinery next break down? How costly and time-consuming will repairs be? Can you afford to be without low-cost Vibraswitch protection? Over 50 conveniently located sales-service offices. Write for address of the one nearest you.

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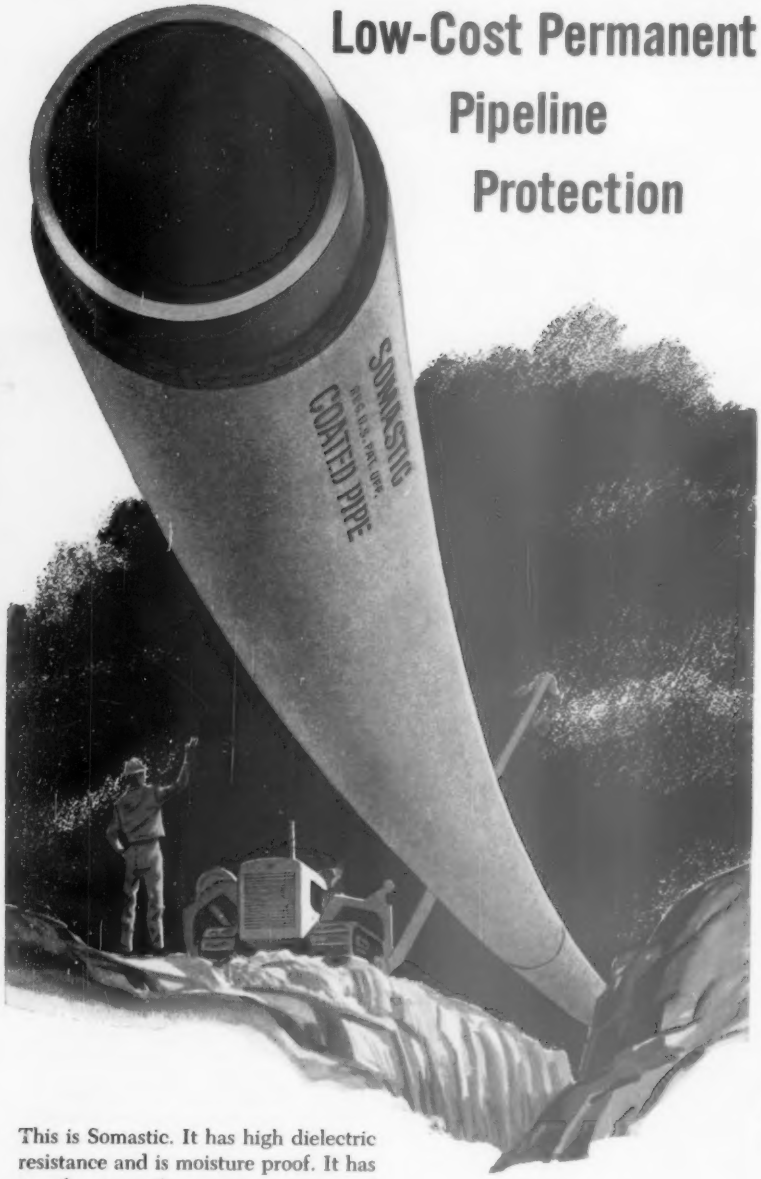

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CALENDAR

AUGUST

14-17 American Society of Mechanical Engineers, American Institute of Chemical Engineers, heat transfer conference and exhibit, Statler Hilton Hotel, Buffalo, N. Y.

14-19 National Congress of Petroleum Retailers, Inc., annual session, Shamrock-Hilton Hotel, Houston.

15-16 North Dakota Oil and Gas Association, annual meeting, Grand Pacific Hotel, Bismarck.

15-26 Sacramento State College, summer institute on nondestructive testing, Sacramento, Calif.

19 Southern Gas Association, roundtable conference on pipeline engineering, Mayo Hotel, Tulsa.

22-26 Gordon Research Conference, catalysis, Colby Junior College, New London, N. H.

26 Southern Gas Association, transmission management fall conference, Shamrock Hilton Hotel, Houston.

29-31 Appalachian Gas Measurement Short Course, University of West Virginia, Morgantown, W. Va.

30-Sept. 2 American Association for the Advancement of Science, Alaska Division, eleventh Alaskan science conference, Anchorage.

SEPTEMBER

6-7 Chemical Institute of Canada, organic chemistry division conference, Edmonton.

7-9 American Society of Mechanical Engineers, joint automatic control conference, Massachusetts Institute of Technology, Cambridge, Mass.

7-10 Billings Geological Society, annual field trip, Hebgen Lake-Madison Valley area of southwestern Montana.

8-9 National Research Council, Chemical Institute of Canada, tenth Canadian high polymer forum, Alpine Inn, Montreal.

8-9 Mid-Continent Oil and Gas Association, Louisiana-Arkansas division, annual meeting, Roosevelt Hotel, New Orleans.

8-10 Chemical Institute of Canada, western regional conference, Regina.

8-10 Intermountain Association of Petroleum Geologists and Eastern Nevada Geological Society, field trip, economic geology of east-central Nevada.

11-13 New Mexico Petroleum Industries Committee, annual convention, Western Skies Hotel, Albuquerque.

11-16 American Chemical Society, national meeting, New York City.

14-15 Western Petroleum Refiners Association, Rocky Mountain regional technical-industrial relations meeting, Henning Hotel, Casper, Wyo.

14-16 National Petroleum Association, annual meeting, Traymore Hotel, Atlantic City, N. J.

14-16 National Industrial Conference Board, eighth annual marketing conference, Waldorf-Astoria Hotel, New York.

15 Natural Gasoline Association of America, Rocky Mountain regional meeting, Palliser Hotel, Calgary.

15-16 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual engineering management conference, Morrison Hotel, Chicago.

16-17 Kansas Geological Society, twenty-fifth annual field conference, northeastern Oklahoma, Western Hills Lodge, Wagoner, Okla.

18-21 American Society of Mechanical En-

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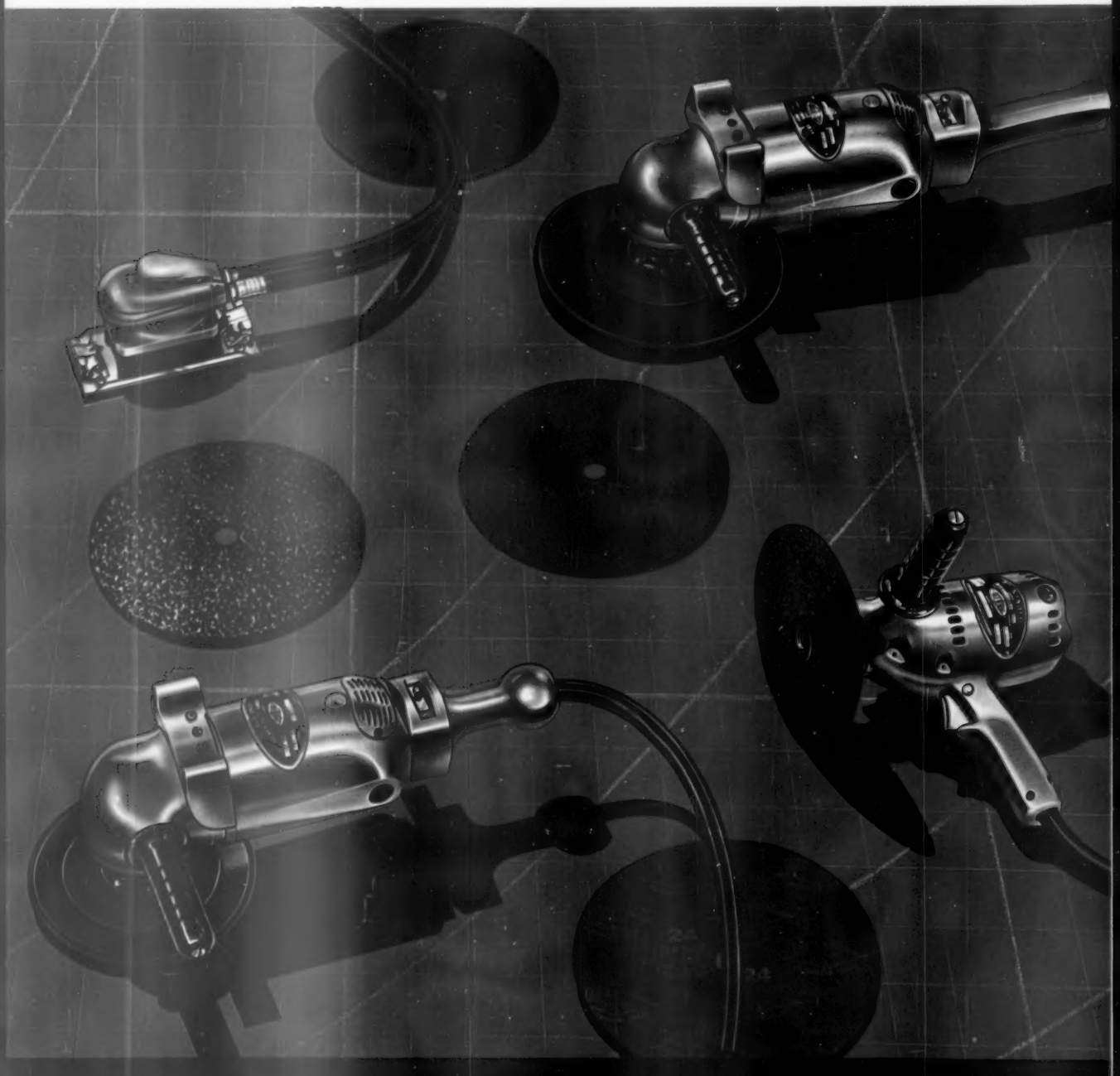

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Exclusive design features include a remote exhaust system which carries exhausting air and lubricant away from the work and the operator; a palm switch paddle for convenient, comfortable one hand control; and the efficient SIOUX mechanical design which requires up to 30% less air for the same amount of work. Oscillating orbital action produces a superior finish; for wet or dry sanding. It's powerful, light, and perfectly balanced for feather edging.

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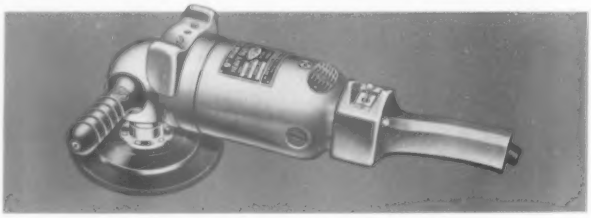
SIOUX HIGH SPEED H. D. SANDERS



SMOOTH, powerful SIOUX Sanders operate with cost cutting speed and ease. They're designed with stamina and dependability for the most punishing use. Heat treated gears, and permanently lubricated bearings help assure long, trouble-free life. They're the best buy in the long run.

SIOUX ABRASIVE DISCS *cut fast, run cool!*

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REGULAR—Regular discs are intended for work on light gauge metal where heat generated by heavier type might cause warpage or metal expansion. Resin bond tempered aluminum oxide grain is used on Regular and all SIOUX discs for maximum cutting action.

OPEN COAT—Open coated discs are intended for paint removal, and for cooler grinding on curved, or recessed surfaces. They are recommended for use anywhere an abrasive is needed that should not load or clog.

GRIND-A-LITE—The new Grind-A-Lite disc is intended for general sanding operations on light gauge metal. It is light, flexible and excellent for use on contoured surfaces. It cuts sharper, runs cooler, loads less, and lasts longer than most other discs.

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gineers, petroleum mechanical engineering conference, Jung Hotel, New Orleans.

19-21 Texas Mid-Continent Oil and Gas Association, annual meeting, Granada Hotel, San Antonio, Tex.

20-21 Illinois oil industry convention, sponsored by Illinois Oil and Gas Association, Illinois Oil Council, Illinois Petroleum Marketers Association, and Chicago Gasoline Jobbers Association, St. Nicholas Hotel, Springfield.

21-23 Pacific Coast Gas Association, annual meeting, Westward Ho Hotel, Phoenix.

25-27 American Association of Oilwell Drilling Contractors, annual meeting, Roosevelt Hotel, New Orleans.

25-28 American Institute of Chemical Engineers, meeting, Mayo Hotel, Tulsa.

25-28 American Institute of Electrical Engineers, petroleum industry committee, electrical conference of the petroleum industry, Hotel Skirvin, Oklahoma City.

26-29 American Welding Society, fall meeting, Penn-Sheraton Hotel, Pittsburgh.

26-30 Instrument Society of America, instrument-automation conference and exhibit, and fifteenth annual meeting, Coliseum, New York.

27-29 Mid-West Gas Association, annual school and conference, Memorial Union, Iowa State College, Ames.

29-30 Mid-Continent Oil and Gas Association, Mississippi - Alabama division meeting, Grand Hotel, Point Clear, Ala.

29-Oct. 1 West Texas Geological Society, field trip, Delaware Basin of West Texas and southeast New Mexico.

OCTOBER

2-5 Society of Petroleum Engineers of AIME, annual fall meeting, Denver.

3-4 Independent Natural Gas Association of America, annual meeting, Fontainebleau Hotel, Miami Beach.

4-5 University of Kansas, gas-measurement institute, National Guard Armory, Liberal, Kans.

5 Society of Plastics Engineers, Inc., regional technical conference, Mark Hopkins Hotel, San Francisco.

6-7 National Association of Corrosion Engineers, annual western region conference, Sheraton - Palace Hotel, San Francisco.

6-8 National Association of Corrosion Engineers, southeast region conference, Dinkler-Plaza Hotel, Atlanta, Ga.

6-8 National Academy of Sciences, National Research Council. ninth national clay conference, Purdue University, Lafayette, Ind.

10-12 American Gas Association, annual convention, Atlantic City.

11-14 National Association of Corrosion Engineers, northeast region conference, Prichard Hotel, Huntington, W. Va.

12-14 Southwestern Federation of Geological Societies, annual meeting, Wooten Hotel, Abilene, Tex.

13-14 California Natural Gasoline Association, annual fall meeting, Hotel Miramar, Santa Monica, Calif.

13-16 Taft, Calif., Oildorado, fiftieth anniversary celebration.

14-15 University of Texas, E. P. Schoch lecture series on rate processes, Batts Hall Auditorium, Austin.

14-16 New Mexico Geological Society, annual field conference, Chama basin of northern New Mexico, registration, Taos, Oct. 13.

17-19 American Society of Mechanical En-

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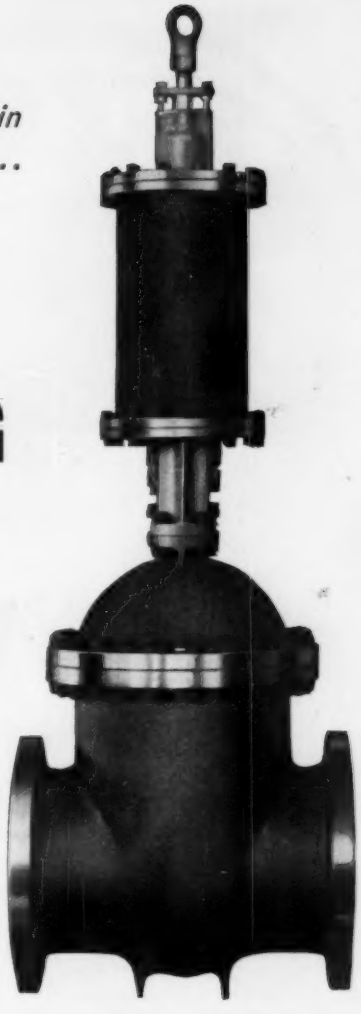
specify DARLING cylinder-operated GATE VALVES



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Manual or Automatic Operation may be used—by means of four-way valves which control the flow of fluid or air to the cylinders.

Air, Oil or Water may be used for the operating media—and can be piped from the lines on which the valves are installed.

Engineered for Your Application—Valves can be supplied, piped and equipped with solenoid or pilot-operated control valves, limit switches and positioners for remote or local operation.

Write for detailed information or quotes, giving size of valves required, kind of valves (Iron Body Bronze Mounted, All-Iron, Bronze, Special Alloy, etc.), service conditions, maximum disc pressure and minimum cylinder pressure.

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Bondstrand is a corrosion-resistant, high strength, rigid pipe made of glass filaments bonded in chemically inert synthetic resins. It is capable of withstanding high pressure and the corrosive attack of many salt, acid, and alkaline solutions. The outside surface is equally resistant because the pipe is made entirely of corrosion-proof materials. No painting or maintenance is necessary.

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Bondstrand is now available in sizes from 2" through 8" with all necessary couplings and fittings. Larger sizes available on special order.

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gineers, American Society of Lubrication Engineers, lubrication conference, Statler Hilton Hotel, Boston.

17-19 University of Minnesota, Pennsylvania State University, Colorado School of Mines, biannual symposium on drilling and blasting, Golden, Colo.

19-20 National Association of Corrosion Engineers, north central region conference, Schroeder Hotel, Milwaukee.

19-21 Gulf Coast Association of Geological Societies, convention, Biloxi, Miss.

19-21 Rocky Mountain Oil and Gas Association, annual convention, Brown Palace Hotel, Denver.

20-21 American Institute of Mining, Metallurgical, and Petroleum Engineers, Los Angeles Basin, fall meeting, Huntington Sheraton Hotel, Pasadena, Calif.

20-23 Odessa Oil Show, Odessa, Tex.

23-25 Independent Petroleum Association of America, annual meeting, Statler-Hilton Hotel, Dallas.

24-25 American Society of Mechanical Engineers, American Institute of Electrical Engineers, fuels conference, Daniel Boone Hotel, Charleston, W. Va.

25-28 National Association of Corrosion Engineers, south central region conference, Mayo Hotel, Tulsa.

26-27 Armour Research Foundation of Illinois Institute of Technology, computer applications symposium, Morrison Hotel, Chicago.

26-27 Western Petroleum Refiners Association, annual question and answer session on refining technology, Rufus Garrett Hotel, El Dorado, Ark.

28 Natural Gasoline Association of America, southern regional meeting, Carlton Hotel, Tyler, Tex.

NOVEMBER

3-4 American Association of Petroleum Geologists, Pacific section, annual meeting, Ambassador Hotel, Los Angeles.

3-4 Society of Automotive Engineers, national fuels and lubricants meeting, Mayo Hotel, Tulsa.

6-9 Chemical Institute of Canada, chemical engineering division, conference, Quebec City.

7-10 Society of Exploration Geophysicists, international meeting, Moody Convention Center, Galveston, Tex.

14-16 American Petroleum Institute, fortieth annual meeting, Conrad Hilton, Palmer House and Congress hotels, Chicago.

15-16 University of Kansas, natural-gas pipeline institute, Courthouse, Liberal, Kans.

15-17 Southwest Research Institute, Air Force, Navy, industry propulsion systems lubricants conference, Hilton Hotel, San Antonio, Tex.

18 Natural Gasoline Association of America, Panhandle Plains regional meeting, Herring Hotel, Amarillo, Tex.

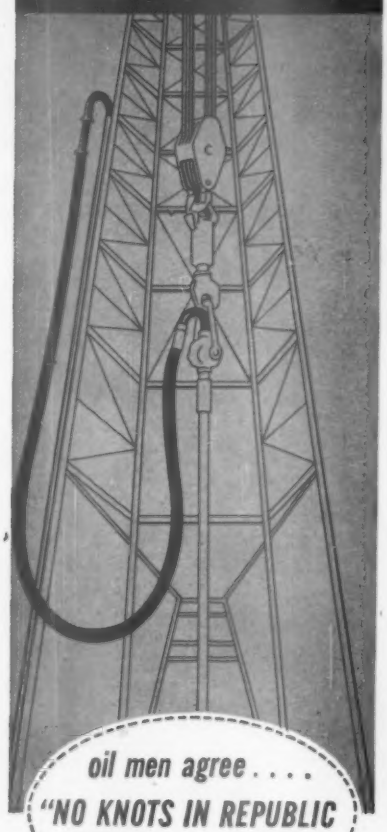
27-Dec. 2 American Society of Mechanical Engineers, winter annual meeting, Statler Hilton Hotel, New York.

DECEMBER

4-7 American Institute of Chemical Engineers, meeting, Statler Hotel, Washington.

5-7 Interstate Oil Compact Commission, annual meeting, Westward Ho Hotel, Phoenix.

REPUBLIC ROTARY HOSE



oil men agree . . . .
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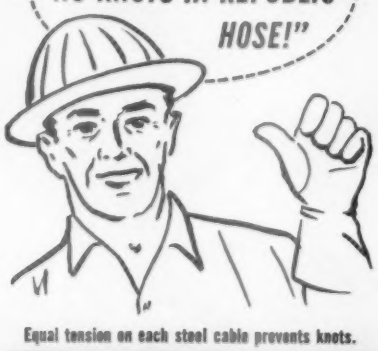

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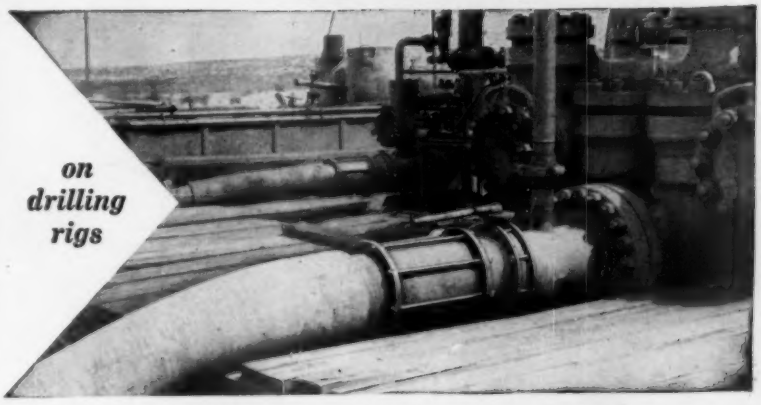

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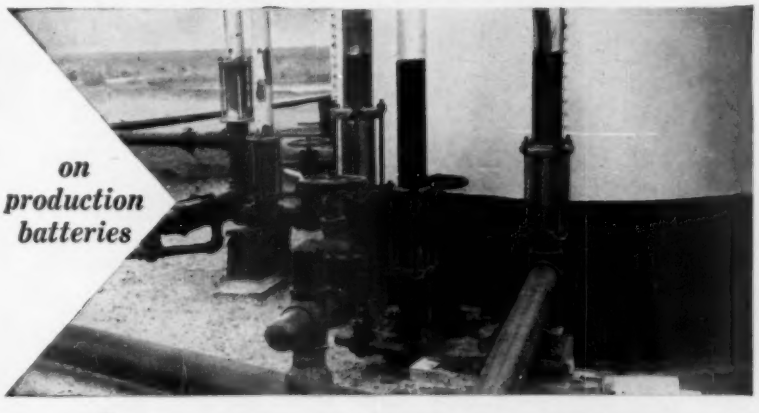

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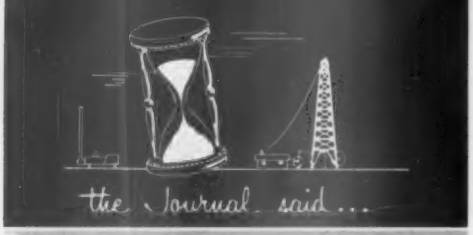

50 years ago

August 11, 1910

California operators are gravely concerned over a threatened blowout in another giant oil well that blew in last week in the Lakeview area at Midway. American Oil Fields Co.'s 79 well, less than ¾ mile from Union Oil Co.'s notorious Lakeview gusher which has been flowing out of control since March 15 at rates at times up to 90,000 bbl. daily, started off at 20,000 bbl. daily but has been steadily increasing its flow and showing signs of getting out of control. Approach of rainy season brings danger of hastily built earthen reservoirs being washed out and millions of barrels of accumulated oil flooding the country side.

The largest cargo of cased oil ever loaded from any port south of Baltimore moved out of The Texas Co.'s docks at Port Arthur, Tex., last week destined for Brazilian ports. It consisted of 100,000 cases of illuminating oil in hardwood boxes, prepared for handling for interior distribution.

25 years ago

August 8, 1935

Stanolind Oil & Gas Co. (now Pan American Petroleum Corp.) takes over operation of Yount Lee Oil Co. properties acquired in $42,000,000 deal. Its newly acquired properties put Stanolind into fourth place among Gulf Coast producing companies, and add materially to its already large holdings in East Texas. They include more than 300 producing wells in East Texas, nearly 290 wells in 11 Gulf Coast fields, extensive undeveloped acreage, and large pipeline, tank farm, and storage facilities in both areas.

New Dickinson field in Galveston County rises on horizon as a potential rival of such major Gulf Coast fields as Anahuac and Hastings. A 2½-mile southwest extension last week by Coast Petroleum Co. 1 Maco Stewart throws new light on the large extent of its producing area with multiple sands at 7,600 to 8,000-ft. depths. Six rigs are running with 10 wells completed to date.

10 years ago

August 10, 1950

Much-publicized Jacob Beck's 1 Sancrant 10-year-old "granite" test in Monroe County, southeastern Michigan, is reported by oil scouts as abandoned. Drilling since June 1940, the wildcat penetrated 1,761 ft. of granite from 3,625 to 5,386 ft.

Gulf Oil Corp. reveals plans for construction of world's largest catalytic cracking unit at its Port Arthur, Tex., refinery. New unit, costing $8,000,000, will have daily capacity of 60,000 bbl.

JOURNALLY SPEAKING

Ask Your Banker

WHAT'S THE VALUE of crude oil in the ground?

We just heard a story about one banker who figured it at only 65 cents per barrel.

It seems that an integrated oil company applied to this bank for a loan, and showed its balance sheet and account books. The company had proved reserves of 100,000,000 bbl., and for years had carried this asset on its books at $1 per barrel.

Its accounting practice was to list all assets at cost or value, whichever is less. This year it wrote down many of its assets but didn't change the valuation of its crude reserve.

The banker discovered that during the first half of this year the company's net return on the sale of refined products was 35 cents per barrel of crude less than the return in 1959. He told his client:

"Since you now get 35 cents less for the products from a barrel, your crude reserves are worth 35 cents a barrel less than they were last year. So I am writing down the valuation of your reserves to $65,000,000."

The oil man hit the ceiling.

"Why, it would cost us $1.50 or more per barrel to replace those reserves either by purchase or discovery."

"But," reasoned the banker, "the value of crude depends on what you can get for the products made out of it. If you considered your reserves worth $1 a barrel last year, on today's products market they are worth only 65 cents now."

"But," screamed the oil man, "these low product prices are only temporary. They're bound to go up."

"I'll believe that when I see it," said the stony-eyed banker. "If and when that happens I'll mark up the valuation of your reserves proportionately."

That story may not be typical. It may be that most companies don't keep their books that way, and that most bankers don't figure reserve valuations that way.

But the incident contains a grain of truth and some food for thought.

That banker was dead right about one thing: the value of a barrel of crude oil is the market value of the products that are refined from it (less, of course, lifting and processing charges).

You can keep your books any way you want to, but you can't get away from the basic truth that when the price of refined products goes down, the value of crude oil goes down with it—even though the price of crude oil may not drop immediately or proportionately.

And if the value of crude oil—as measured by what you can get for it—is below your cost of replacing your crude reserve, every barrel you sell liquidates you out of business that much faster.

You may have a moral conviction that crude oil is intrinsically "worth" a lot more than the present value of its products. You also may have a firm belief that sooner or later product prices are going to go up enough to cover the cost of replacing crude reserves. But that doesn't alter the fact that from a strictly dollars-and-cents viewpoint the value of crude is determined by the current market price of products.

Now if you are an independent producer there would seem to be only two things you can do about this. Either admit that you are liquidating by selling merchandise off your shelf at less than replacement cost, or find some way to hold on by selling as little as possible until conditions change.

But if you are an integrated company there may be several things you could do to stop depreciating the value of your crude reserves, things that would operate to move product prices up instead of things that push them down.

This would mean stop overproducing, overimporting, overrefining, and overmarketing—and particularly stop figuring that losses in marketing can be made up by profits from the production department.

The intricacies of modern corporation accounting are too deep for us, but when we went to school our economics prof took a dim view of the philosophy that seems to motivate some oil companies: that what they lose on the barrel they make up on the volume.

What does your banker think about it?

—Henry D. Ralph

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Oil marketing needs a "slum-clearance" program

ONE THING the oil industry needs these days is a policy of "creative destruction"—tearing down the old to build anew instead of patching and defending what's obsolete.

This applies not so much to physical facilities as to attitudes, operating methods, thought habits. A sort of "mental slum-clearance" program is in order.

The industry is not moving fast enough in adapting to changing economic and sociologic conditions. And nowhere is this lag more apparent than in marketing methods and in the coordination of refining with marketing.

A PRIME EXAMPLE is the way refinery runs are kept high during the summer—far above the level of seasonal demand. Years ago this perhaps was wise, to build stocks of heating oil for the winter.

But the habit has persisted although made unnecessary by a big reserve of unused refining capacity, widespread pipeline distribution, and a slowdown in the growth of heating-oil demand. Once big summer runs may have forestalled winter marketing troubles; today they invite them.

Another example is the market for No. 2 distillate as a whole. The oil industry neither sired nor adopted the home-heating business. Home owners and builders raised the waif to adulthood. Oil marketers and refiners got a free ride on the oil-heating boom for many years and came to expect constant expansion as their birthright.

Then gas moved into the home-heating field in a big, big way, and the market for No. 2 oil became nearly static. But refiners continued to act as though demand were limitless. It is good to note that they have now waked up to this and at long last are taking steps to ascertain and to serve the real needs of home-heating customers.

Many more examples of the need for mental slum clearance can be found in gasoline marketing. Marketing is in great turmoil. Practices and policies which may have served well years ago have become blights on the industry's progress, on its profits structure, and on the facade it presents to its dealers, to its customers, and to the general public.

The list here is long. Things in apparent need of rehabilitation include dealer margins, differentials between branded and unbranded sales, area wholesale pricing policies, handling of commercial accounts, jobbing territories, dual distribution channels, crude-processing and product-exchange arrangements, and many others.

THERE ARE COBWEBS in the industry's thinking about its market. It needs to shake off old habits and seek new approaches.

If it would take an objective look at the causes and cures of price wars, at why oil marketing is constantly on the Federal Trade Commission's frying pan, at what will really serve dealers and consumers best, it will find a lot of old structures that should be torn down and rebuilt.

How Some Companies Fared in the First Half

	Gross Income		Net Income		Refinery Runs (bbl. daily)		Liquid Production (bbl. daily)	
	1960	% Change	1960	% Change	1960	% Change	1960	% Change
Standard (N. J.)	4,317,000,000	1.46	315,000,000	.....	2,835,000	1.87	2,519,000	0.16
Texaco	.....	.....	177,342,169	7.51	.....	.....	.....	.....
Gulf	1,604,000,000	2.04	156,095,967	10.07	755,358	10.99	1,465,817	14.10
Socony Mobil	1,446,400,000	6.25	83,400,000	8.17	573,000	0.88	301,000	1.69
Standard (Ind.)	1,000,316,000	0.33	64,887,000	−17.71	622,588	− 6.53	312,417	− 0.79
Standard (Calif.)	980,710,000	6.70	128,589,000	8.83	.....	.....	.....	.....
Shell	903,940,713	0.56	69,312,041	0.18	502,560	3.53	320,400	− 0.19
Phillips	603,098,987	0.92	51,747,822	− 2.75	235,696	0.41	282,294	9.58
Continental	395,400,000	3.02	28,493,000	− 2.29	184,857	5.55	199,347	8.48
Sun	366,800,000	− 5.05	20,032,000	− 8.84	237,818	0.54	148,917	13.25
Tidewater	287,729,000	3.34	18,277,000	− 1.91	237,000	6.76	115,000	2.68
Atlantic Refining	279,215,000	0.61	16,917,000	− 2.53	194,800	− 0.76	151,100	10.86
Union Oil	260,671,000	4.31	13,370,000	24.12	159,313	− 3.58	95,494	4.42
Sunray	229,103,032	0.30	18,742,708	−10.53	144,325	− 8.76	90,137	7.34
Ohio Oil	196,754,775	26.17	17,732,709	− 4.44	99,610	0.19	107,307	− 2.75
Standard (Ohio)	182,011,875	− 0.89	10,956,032	10.88	143,421	0.79	38,741	0.28
Richfield	174,672,161	5.19	13,987,894	30.79	146,543	7.53	76,208	10.88
British American	158,019,000	0.87	13,730,000	63.53	122,762	− 2.53	62,237	− 6.20
Skelly	125,236,348	− 5.14	11,089,524	−20.54	49,972	4.30	63,276	− 5.19
Delhi-Taylor	47,300,000	10.13	2,150,000	48.28	41,900	2.95	6,044	13.42
Anderson-Prichard	36,618,477	2.32	2,166,692	−28.82	30,134	1.71	14,296	− 2.86

It's a Tough Year for Making Money

• Some companies are up, and some are down in first-half reports. The Ups claim increased efficiency and more sales. The Downs blame low prices and oversupply. Together they tag 1960 as one of oil's most competitive years.

ENOUGH first-half earnings reports are in now to confirm everyone's suspicions that 1960 will be a hard year for oil operators to show gains in profits.

Among the first 21 large companies to report, 10 recorded profit gains for the first half of this year compared with the first 6 months of 1959. One equalled its 1959 record, and another 10 reported trailing their 1959 showings.

Companies showing gains all cited similar explanations for their good fortunes: Greater efficiency and increased sales of refined products, chemicals, and natural gas.

Firms with lagging profits also touched on a common reason: Poor product prices in the second quarter and curtailed crude production throughout the first half because of the world petroleum oversupply. These explanations also were given by the top majors as the reason their profit margins were not larger.

The earnings statements tell a common story, whether the profits are up or down. Oil companies generally are doing a greater volume of business but getting a slimmer margin of profit.

The days ahead . . . Oil executives reporting to their stockholders all admit that world-wide competition has toughened the industry, but they are not writing off 1960 yet as a bad year.

Gasoline and heating-oil prices increased in June and July. Crude prices showed a tendency to hold, even in face of a few isolated cuts. If these price trends continue, prospects are good for the last half.

Several executives, however, sounded warnings that this outlook is threatened. Sunray Mid-Continent Chairman R. W. McDowell noted that the industry's refinery runs are being maintained at an alarmingly high level. He warned: "Immediate and continued restraint will be necessary to avoid excessive inventories over the balance of the year."

Heavy inventories, especially of gasoline at the end of the motoring season, could plague the industry all winter and result in the lower prices that hurt profits.

In other areas, oil companies generally give the appearance of trying to counteract the squeeze on profits. Their reports predict more marketing and refining moves abroad, especially in Italy and West Germany; greater emphasis on chemicals; still tighter controls over costs; and more moves to diversify into fields outside petroleum.

How they fared . . . The profit leaders among the majors included Texaco, Gulf, Socony Mobil, and California Standard.

Giant Jersey Standard and Shell ended the first half about even with last year. Indiana Standard's profits were off from the same period in 1959.

An example of how hard profit gains are coming this year is shown in Jersey Standard's report. The company showed the same $315-million first-half profit for the past 2 years. Yet this year, product sales are up 6%; total revenue shows a nice gain; crude production and refinery runs are up; and capital expenditures have been cut $13 million.

Texaco's world-wide operations reached record levels in the first half of this year and resulted in a 7.5% increase in profits.

Gulf reported that more than half of its first-half profit gain occurred in the United States with the balance coming principally from operations in the Eastern Hemisphere. California Standard noted its world-wide production in the first 6 months was a record for the company.

Ohio Standard accomplished a neat financial trick in its first-half operations. Despite a slight drop in operating revenue, the company still managed to increase profits over 1959.

The explanation from Sohio management: Record sales of Sohio's branded gasolines, increased operating efficiencies of new facilities, and results of continuing efforts to reduce costs.

Prices govern . . . The increasing concern over product prices is reflected in reports of firms failing to show gains in first-half profits.

Indiana Standard, Sunray Mid-Continent, and Continental specifically blamed the lower gasoline and fuel-oil prices for the sag in their profits.

Continental also reported its earnings for the period were affected by a $1-million increase in the provision for possible losses on foreign operations. The additional appropriation was made because of considerable expansion in the company's foreign activities.

Continental partially offset its lowered income by a $3.7-million reduction in intangible drilling costs. This was achieved by fewer well completions, higher proportion of cheaper shallow wells, and increased efficiencies in drilling.

Phillips, Atlantic Refining, and Anderson-Prichard all forecast much better last half operations.

Phillips expects increases in its Venezuelan crude production, in the value of its petrochemical sales, and in total sales volume.

Atlantic Refining enjoyed a 63% improvement in profits for the second quarter. This put first-half profits nearly even with last year's figures.

A similar second-quarter spurt was made by Tidewater which also showed respectable earnings for the 6 months.

Atlantic Refining President Henderson Supplee, Jr., said his company instituted a stringent reduction in operating costs in the second quarter. "During the spring and summer," he said, "we have been reducing personnel throughout the company in order to bring productivity and efficiency to the point necessary to remain fully competitive.

"When reduction is completed, important payroll savings will contribute further to a general reduction in operating costs. These savings were partially reflected in the second-quarter results and should be larger in the third and fourth quarters."

Upturn in Canada . . . A brighter prospect for Canadian oil operations this year is reflected in the first-half report of British American.

British American enjoyed a jump in earnings from $8.4 million to $13.7 million, through increased production and sale of oil and gas.

British American gave this forecast for Canada through the year: Export demand up 30% over last year. Crude production in Western Canada expected to increase 8%. Sales of natural gas to show substantial increases, with the big jump to occur in 1961 and subsequent years from export programs now being completed. Total consumption of products in Canada should increase by about 5%.

Crude production in Canada, however, is still only about 50% of potential. British American President E. D. Loughney declared at the present producing rates and prices "there is little doubt that the profitability of producing operations for the industry is barely adequate to support the cost required to discover and develop new reserves to meet future demand."

Loughney said the long-term outlook for steady growth of markets for Canadian oil and gas should improve the profits outlook.

Agreement Clears LPG-Storage Patent—Almost

MOST of the LPG industry is now free to store products in underground salt caverns without fear of royalty demands or threat of lawsuits.

Fifty companies, 14 of them part-interest owners of salt storage, last week agreed to pay $1,500,000 to the Sid Richardson Estate interests for permanent immunity from Richardson's patent.

The 50, operating about 86% of the nation's LPG storage, chipped in according to the size of their storage as compared with the national total, as shown by The Oil and Gas Journal's survey (OGJ, Sept. 28, 1959, p. 75).

They then told "six to ten" holdouts that they have 90 days in which to contribute their share and "receive like immunities."

If the holdouts contribute also, it is likely that the patent will be dedicated to public use. If not, those signing the agreement may take one of two courses: Let Richardson keep the patent, having granted them immunity, or form a joint company to own the patent and license its use.

The agreement ended two federal court suits in which the Richardson estate sought to collect a ⅛-cent royalty on each gallon of product withdrawn from a storage cavern leached out of salt. Estate attorneys are now expected to move for dismissal of the suits, filed in Amarillo and involving Skelly Oil Co., Pan American Petroleum Corp., Warren Petroleum Corp., and Socony Mobil Oil Co., Inc.

Title for the patent for the time being will remain with the Richardson interests. Attorneys said that after the 90-day period they would poll the participating companies to determine final disposition of the patent title.

Two companies not in the Journal's last survey but which have storage facilities under construction, asked permission and were allowed to contribute to the settlement.

In settling the suit, the companies contended they still do not believe the patent is valid. But the settlement, they said, is the cheapest, simplest method of disposing of the problem.

The suits were significant because of the tremendous growth of salt storage for LPG in recent years. Of probably more than 50 million barrels of underground storage capacity in the U. S. and Canada, more than 80% is in salt. Fees under the Richardson patent, if upheld, would have exceeded $1,000,000 a year if product withdrawn totaled only half the storage capacity.

Why the Farmout Business is Booming

• High lease rentals and tight drilling budgets have spurred the interest of the majors in farmouts. Independents often get better drilling deals in a farmout than by leasing acreage and drilling on their own.

Howard M. Wilson
District Editor

"THE MAJORS have the budgets to buy acreage on trend. But their drilling budgets are restricted. Rather than let the leases go by default, it's certainly to their advantage to let somebody else have a crack at it."

This, in a nutshell, is one independent operator's summation of an important development in the oil industry: the flourishing farmout.

In the midst of a general drilling recession in the United States, the biggest majors and the smallest independents have joined hands to keep wildcatting moving at a faster pace in 1960 than in 1959.

Total well completions this year have dropped more than 14% from last year's level, but wildcat drilling is up slightly. Since most farmouts are wildcats, the healthy condition of the farmout business is self-evident.

Thus, while development drilling may languish, the farmout wildcat is playing a major role in adding reserves and keeping rigs busy.

The industry keeps no statistics on farmouts. However, a survey of more than a dozen companies last week disclosed that farmout drilling is becoming, more and more, a necessary economic tool that can turn a profit for all parties involved.

What's behind it? . . . At a time when allowables are low, costs are high, and crude prices are soft, why all this farmout drilling?

The answers are as many as the companies that provide them.

There is certainly no agreement, for example, that the acreage offered by the majors is better, or worse, than in the past. The majors contend they offer nothing better, if as good, although they freely admit they have more in quantity.

The independents are divided on this issue of quality. But they do agree they have more to choose from.

The real incentive for the independent who chooses the farmout route lies in the fact that, in many cases, he can get better drilling deals than he can by leasing his own acreage and drilling it himself. While the profits, if any, are less, the risk is spread, and he has more assurance of staying in business while adding to his reserves.

"Our life blood is finding reserves," explains one operator. "If we've got some exploration money, we've got to spend it or we'll be liquidating ourselves every day."

Another says flatly that in South Louisiana's expensive lease acreage, where rentals are high and the pay sands lie below 10,000 ft., he would prefer taking a farmout to buying the lease alone and paying the full cost of the well.

This attitude may well be the crux of the matter. The independents actually are drilling fewer total wells this year than last year, but they are drilling more farmouts than ever.

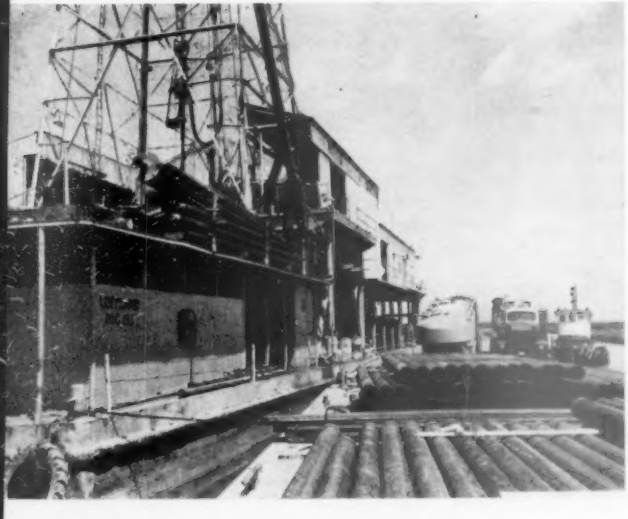
The majors . . . General belt-tightening in the oil industry is behind the willingness of the major companies to farm out far more acreage than in the past.

They hesitate to admit they are drilling fewer wells themselves—and, indeed, some majors are actually keeping pace with their 1959 programs.

The main trouble lies in the high cost of rentals and the normal reluctance to let potentially productive acreage go back to the landowner without a test. The only answer: Farm it out.

One of the biggest companies in the business explains it this way: "The majors have a large backlog of acreage and are getting no return on it. A lease is a capital investment, and we've got a lot of it tied up. Times are getting tighter for everybody, but we

Community-effort farmout pays off for seven companies



Seven companies proved in June that the "community effort" farmout can pay off.

Four companies pooled their leases to form a 5,200-acre operating unit in Vermilion Parish, Louisiana. They drilled a dry hole and then made a farmout deal with three other companies.

The second wildcat was a ringing success—a gas-distillate well, dually produced, that has 150 to 200 ft. of net producing sands. One sand tested at 100 bbl. of distillate per million cubic feet. The well is located at West Buck Point at the west end of Vermilion Bay.

The three which took the farmout are Robert Mosbacher, Kilroy Co. of Texas, and Harry Hurt, all of Houston. The four lease owners are Union Oil Co. of California, Monterey Oil Co., Republic Natural Gas Co., and Kerman Oil Co. All seven now hold an interest in the 5,200-acre unit.

Loffland Brothers Co. was the drilling contractor. The rig (left) is shown on location.

in an off Year

want to evaluate this acreage. The farmout is the cheap way to do it."

The company that makes this observation is practicing its preaching. So far this year it has drilled only two exploratory tests in the Gulf Coast area and has six drilling. But it has farmed out 30 other wildcats in the same period.

True, the choice tracts it kept for itself. But in sheer numbers the farmout pattern is plain. The 30 this year already are 50% more than all of 1959's and 6 wells more than all of 1958's.

What prevails on the Gulf Coast, says this major, is true throughout the nation generally.

Cooperation . . . There are virtually as many kinds of deals on farmouts as there are farmouts.

Without exception, companies queried say each deal is negotiated to fit the given situation, and it is difficult to spot changing patterns that accompany the increase in farmouts.

There does, however, appear to be one development that is significant. This is what one major calls the "community effort."

"Our policy years ago was not to buy acreage unless we were going to drill it," the company says. "The pattern is shifting. You may buy acreage and develop it by community effort."

By this the company means it joins with owners of surrounding leases to finance exploratory wells via the farmout method. One may contribute acreage and the others dry-hole money.

This policy has emerged partly because of the type of leasing that has developed in recent years—trend leasing.

"There's a lot of oily country you can't pin down with the exploratory tools we have," the major says. "But you go out and buy up all this acreage to protect yourself. And there it sits. You don't know where to drill, but you know you can find production."

How do you get it evaluated?

"No one outfit can afford to do all the drilling. So you give some other company the money to sink a well. That well will lead to where to drill next. Yes, the industry has gone into a community effort on trend drilling."

The independents recognize this "community effort" pattern, too, although the job of arranging such multicompany deals usually falls to their lot—not to the majors.

"Usually the person who takes the farmout has to get the deal together," one independent says. "But the industry as a whole generally is coming to realize that pooling resources is the most economic way to do business.

"The companies are satisfied with a smaller piece of pie, while a few years ago they would hold out for the whole thing."

Specific deals . . . While companies wanting farmouts still beat a path to the door of the majors, it is certainly not unusual these days for the leaseholder to reverse this procedure.

"It works both ways," several companies comment.

Generally the farmouts are for the shallower wells—7,000 to 8,000 ft. and less while the majors drill their own deep wells of 10,000 ft. or more. The smaller companies do not care to risk the big money required for the deeper tests.

But even this is no hard and fast rule. Farmout companies are using a little community effort themselves to spread the cost and take a flyer on the high potential deep sands, particularly in South Louisiana (see box).

The variety of deals in the farmout business is staggering.

"We might give up a one-half interest on an entire 10,000-acre block to get a well drilled, or we might give up as little as 80 acres and $1 a foot," one major says.

Another says its footage payments vary from $1 to $5. Acreage varies from 40 acres to 1,000—"and we'd give 5,000 acres on one 50,000-acre block for a well."

This same major makes the point that the leaseholder should never make a deal so strict that the farmout taker can be broken.

"The independent is very important to us, and you don't want to run him out," the company says.

One independent says deals for farmouts "are getting a little rougher" because the majors "are scared they will give away something."

But the same independent, in the next breadth, acknowledges that dry-hole money is readily available from the majors.

"They're switching drilling - budget money into dry-hole money, and it's about the cheapest money they can spend," he said.

He found, as a rule, that majors operating in the same area can't get together, and the independent finds himself working up a deal that might give him acreage from one and dry-hole money from a couple of others.

The incentive . . . In these days of low allowables and slow payout, what hope does the independent have of getting his money back, plus a profit, even if he hits?

Almost in chorus, the independents say their chief hope today is not for an oil well but a gasser—and preferably one with high distillate content.

Chances of marketing their production, even with the Federal Power Commission stringing red tape in their paths, are far greater for gas.

"If you have a nice reserve, and are not too far from a pipeline, and not too worried about the FPC, you are better off today with gas," says an independent.

As for oil wells, the incentive in Texas is an 18-month exempt allowable. In some of the nonprorated states of the Rocky Mountains and the upper Middle West, the payout can come faster, too.

A good percentage of the money invested in farmouts is, as every oil man knows, tax money. In some cases it might amount to as much as 80 cents on the dollar. The companies differ, however, as to whether there is more of this money available today than in the past.

One company says: "There's actually less tax money." Another comments: "We've found it holding up well." A third says: "Ours is a family

Some Answers . . .

"Our policy years ago was not to buy acreage unless we were going to drill it. The pattern is shifting. You buy acreage and develop it by community effort."

"Usually the person who takes the farmout has to get the deal together. But the industry as a whole generally is coming to realize that pooling resources is the most economic way to do business. The companies are satisfied with a smaller piece of pie, while a few years ago they would hold out for the whole thing."

operation, and we don't raise money. But we never have trouble finding a partner on a good deal."

An exception . . . While the farmout well is almost always a wildcat, one Houston-based independent of medium size has found it profitable to farm out its development wells.

This company both takes farmouts and gives them—but it changes the pattern on those it gives.

"We make our own discovery, and then we farm out the development," the company says. "We've found it easier to get development money. It's a safe deal for the investor."

The future . . . Is the new emphasis on the farmout here to stay, or is it a passing phase or cycle?

Here again there is no general agreement.

But there are signs that the farmout will continue to be an important way of doing business for many years to come.

Nothing points this up so much as the trend toward short-term leases and high rentals in the better drilling areas of the country.

One major company which had a policy against farmouts has moved into this type of acreage evaluation. And one of the main reasons is the cost of keeping acreage under lease.

"Renewal costs have gone completely out of sight," the company says. "In the past, we would normally renew. But this has become expensive, and we have accelerated farmouts as we get near the expiration date."

Another operator believes that in South Louisiana the day of the 5-year lease and low rental has disappeared. The 3-year lease has replaced it—and this means a great revolving of leaseholdings, unless drilling occurs.

In parts of Texas the 3-year lease is becoming common, as well as the high rental payment. This is indicative of the need for farmout drilling in the years ahead.

Another trend which may keep farmout drilling in a favored spot is the tendency of major companies to invest large sums in offshore leases and foreign concessions. By tying up their drilling budgets in these expensive operations, they are forced to go the farmout route for domestic onshore leases.

For example, the majors spent $282 million for leases off Louisiana last February, and they are spending millions more to test this expensive acreage.

While chasing the big oil offshore and abroad, companies can ill afford to ignore replacement of onshore domestic reserves. The farmout, in 1960 at least, is one way to do it.

Those boundaries are still fuzzy . . .

Just How Great a Distance

THE OFFSHORE boundary problem may eventually inch its way toward a dispute over how many feet there are in a mile.

The solution appears simple because everyone knows how many feet make a mile.

But it is not so simple as that. It depends on what kind of a mile you are talking about.

A land mile is 5,280 ft. But when you start measuring offshore you are no longer on land so that measurement does not help.

At sea, the question concerns the distance of a geographical or nautical mile.

Therein lies the rub.

Those involved with the problem say that Congress, in passing the Submerged Lands Act of 1954 didn't give any definition of a geographical mile.

The U. S. Supreme Court, in its ruling earlier this year, didn't give a definition, either. It simply specified that for the States of Louisiana, Mississippi, and Alabama, the state boundary extends three geographical miles.

Varied views . . . The World Almanac refers to the geographical or sea mile used specifically for the purpose of navigation as a distance equal to one minute of the meridian at the place of measurement.

By this definition, the length of a mile would vary, depending on where you are. For instance, a mile in the North Sea would be far shorter than a sea mile in the Persian Gulf.

The World Almanac also says a nautical mile is 1.150777 statute miles, or 6,076.1516 ft.

But the Handbook of Chemistry and Physics says a nautical mile is 1.1516 statute miles, or the distance of 1 minute of arc on the earth's surface at the equator.

Webster's Collegiate Dictionary,

Mouton Out, Gill in as Pelican

LOUISIANA'S new conservation commissioner, James H. (Buddy) Gill, will get a lively initiation into his job this week when he presides over his first allowable hearing and receives pro-and-con arguments on a recent order limiting multiple completions.

Gill, 46, will have expert advice during the hearing from the outgoing commissioner, Ashton J. Mouton, and the conservation department's chief engineer, Tom Winfiele. Mouton is remaining with the department temporarily during the transition period.

Gov. Jimmie H. Davis appointed Gill, a management-relations counsellor, to the commissioner post.

The allowable hearing is scheduled for 9 a.m. Tuesday at Lafayette. After receiving purchaser nominations and other testimony on market demand, Gill will set the allowable for September and October.

Tied directly into the hearing will be a discussion of Mouton's recent order restricting new multiply-completed wells to a single allowable. Evidence will be taken on the effect of the order and proposed amendments to it.

Winfiele said a number of companies, particularly those with offshore production, have asked to be heard. Offshore producers have grumbled that the restrictions are unfair. They say the high cost of operation in the Gulf of Mexico can be justified only by completing wells in more than one sand.

Mouton's order still permits multiple completions but allows only one production allowable per well. Winfiele said he expects to know by Tuesday how much additional production would result if the new multiples were given an allowable for each completion.

Winfiele and Gill will discuss the formula this week but there will be a delay of some days before it is released to the industry.

Gill conceded he has "a lot to find out" about his job. As commissioner he has wide authority to fix allowables and set conservation rules for drilling and production.

True to form . . . In the past, governors of Louisiana generally, as a matter of policy, have named persons not closely connected with the oil business to the commissioner's post. The Gill appointment is no exception.

His 11-year association with the

Is 3 Miles?

Fifth Edition, defines a geographical, nautical, or sea mile as the length of a minute, or 1/21,600 of a great circle of the earth.

Officially, in Britain, it is 6,080 ft. (the admiralty mile). In the U. S. Webster says, the geographical mile is 6.080.20 ft.

However, in 1954, the U. S. Department of Commerce and the Defense Department agreed to use the international nautical mile of 6,076 ft.

Interior's measure . . . But the U. S. Department of Interior was not in on this agreement and is not bound to a definition of 6,076 ft.

Instead, Interior is inclined to the definition of 6,080 ft. so that is what Interior's Bureau of Land Management is currently using in drawing its offshore maps.

In choosing the longer mile—tentatively at least—Interior is not trying to pick a fight with Defense or Commerce, or anyone else. It is simply trying to avoid a fight with the State of Louisiana (and Mississippi and Alabama) over the length of a nautical mile.

The Bureau of Land Management naturally assumes that Louisiana et al., will want the longest mile possible. Those states are already highly unhappy that they are getting only 3 miles of any sort instead of 3 leagues like Texas and Florida.

So, knowing that Louisiana will go for the long mile, Interior is currently figuring a nautical mile at 6,080 ft. With a little prodding, it probably would extend this to 6,080.20 ft.

If you consider this as minor squabbling, bear in mind the difference it could make in revenue for the state or the federal Government if you add or subtract a few feet all along the Louisiana coastline.

Before the matter of an offshore boundary is eventually settled for once and all, you may be sure that the definition of a geographical or nautical mile must be settled.

Maybe it would be simpler to fill the Gulf of Mexico with soil and use the land mile measurement of 5,280 ft.

Oil Chief

Esso Standard refinery at Baton Rouge did not put him in direct contact with oil and gas production. He started in 1938 as an accountant and then became a laboratory technician. Eventually he was supervisor of three laboratories in the chemical-products division.

Gill resigned in 1949 to become secretary to U. S. Sen. Russell B. Long in Washington and, in 1951, returned to Baton Rouge to become manager of the builders division of the Associated General Contractors, which dealt in labor relations.

In 1954 he organized his own management-relations consulting firm, which he operated until his appointment by Davis. He was active in Davis' election campaign and was grand marshal of the governor's inauguration ceremonies in May.

Born in Oklahoma City, he moved with his family to Baton Rouge while a small child. He attended Baton Rouge schools and Louisiana State University.

Gill said he has no preconceived ideas about conservation for Louisiana except that both the state and producers should "get fair treatment." He will retain Tom Winfiele as chief engineer. Winfiele is a career official who was Mouton's top adviser.

Mouton, in remaining temporarily with the conservation department, said he will help Gill make an "orderly transition" and has confidence that Gill will bring credit to the Davis administration.

Mohawk Buys Crude Lines

TWO GATHERING systems taking 650 bbl. daily of crude from three Oklahoma fields have been purchased by Mohawk Petroleum Co., Tulsa, from Sinclair Pipe Line Co.

The systems, 35 years old, include 60 miles of pipe ranging from 2 in. to 8 in. They are east and northeast of Bristow and handle crude from Kellyville, Heyburn Lake, and Bristow fields.

Earl H. Johnson of Mohawk said 50% of the daily runs will be delivered to DX-Sunray Oil Co. and 50% to Sinclair Pipe Line gathering systems, to be relayed to Sinclair trunk lines near Cushing.

Johnson said the acquisition will not require increased equipment nor personnel. Mohawk operates about 100 miles of other gathering lines in the southwest.

New company will ask FPC approval of gas Sale to Texas Eastern

A DEAL that could send up to 150 million cubic feet of South Texas gas into the mainline of Texas Eastern Gas Transmission Corp. will be offered to the Federal Power Commission this month.

Border Gas Transmission Corp., San Antonio, is putting together a $10.5 million pipeline program that would tap gas reserves in eight counties.

Border Gas is a new company owned 50-50 by Lehman Brothers, New York investment firm, and Rio Gas Gathering Co., San Antonio, headed by Kendall A. Ehman.

Ehman said the proposal to sell the gas to Texas Eastern kills an earlier plan of Rio Gas Gathering to sell 50 to 100 million cubic feet daily to El Paso Natural Gas Co. for transmission to the West Coast (OGJ, Feb. 2, 1959, p. 59). The El Paso deal, which had been made jointly with Gulf Resources, Inc., New York, failed to develop.

At Houston, Texas Eastern confirmed it has an agreement with Border Gas to take gas if the gathering system is built. The gas would go into Texas Eastern's mainline, which extends northeastward from McAllen, Tex., to the New York area.

Border Gas will submit two proposals to the FPC. The first, costing about $8.5 million, will consist of lines in Starr, Zapata, Jim Hogg, Brooks, and Webb counties. The second, costing about $2 million, will lie in Dimmit, Zavala, and LaSalle Counties.

The lines will vary from 3 to 16 in. in diameter.

Shell Sets Up Marine Group

Shell Oil Co. has established a new Marine Production Group for the Houston area in preparation for an extensive exploration program in the gulf off Texas.

Shell, largest holder of leases in the waters off Texas, expects to announce soon its plans for drilling.

The company has 134,482 acres under lease in the coastal waters. All but 7,762 acres are in the federal zone beyond the 10½-mile state boundary.

F. D. Leigh, former production superintendent in Shell's Marine Production Division for the New Orleans area, will manage the new Marine Production Group for the Houston area.

PROPANE TRUCKS unload their rich cargo at the central injection plant in 13,000-acre Block 9 project as . . .

Atlantic Pumps LPG Into Big Flood

• Nearly a third of a planned 250,000 bbl. of propane already has been forced into the Wolfcamp in one of the industry's most important recovery projects. In another week, a gas chaser will start to work, and then—water.

BLOCK 9 Wolfcamp pool swallowed up thousands of barrels of propane last week as operators pushed one of the most unusual and important miscible projects yet.

The unitized pressure-maintenance program, operated by Atlantic Refining Co., was approved by the Texas Railroad Commission earlier this summer. Moving quickly, the unit began injecting the first of a total 250,000 bbl. of LPG on July 5.

It now has slugged about 35% of the planned total into the reservoir. All LPG will be injected by September 1.

Two huge 1,000-hp. compressors are tuning up now to start shakedown gas-injection runs. And the unit expects to begin injecting small quantities of gas to chase the propane by mid-August—with full-scale injection at least by October 1.

If all goes as predicted, Atlantic will start injecting water with the gas in about 18 to 20 months.

First of its kind . . . The big 13,000-acre Block 9 project will employ the Atlantic-developed high-pressure, gas-injection type of miscible drive (OGJ, May 9, p. 100).

This process is already enjoying huge success in another West Texas pool, Block 31 Devonian.

But the Block 9 operation is unique in that the reservoir will have to be "pumped up" for about 2 years with roughly 10 billion cubic feet of gas and 2,000,000 bbl. of water before pool pressure climbs high enough to maintain this type of drive.

Meanwhile, the propane slug will function as a sort of interim miscible drive.

Behind the propane will come gas in volume equivalent to about 10% of the Wolfcamp's hydrocarbon pore volume. Then the unit will inject gas and water simultaneously to improve the project's areal sweep.

Huge recovery expected . . . The 8,400-ft. Wolfcamp in the field so far has produced only about 4,300,000 bbl. of an estimated 51,000,000 bbl. originally in place.

Primary take will net only about 17% of that total. Atlantic engineers figure that a water flood would jump to about 40% of original oil.

But the miscible drive, they think, should far surpass the flood prospects—boosting total oil recovery to around 44,500,000 bbl. or an astonishing 87 to 89% of in-place oil.

The cost of the project is tagged at about $2,225,000—including the cost of purchased propane and gas.

Streamlined setup . . . Along with everything else, the injection pattern for the Block 9 operation is unusual, too, for a miscible drive. It is a peripheral type. Atlantic engineers feel, however, that response to injection will be faster.

The unit initially converted 13 producing wells along the pool perimeter to input service. It recently drilled and placed in service a fourteenth to fill the only gap in the pattern on the north side.

The compressor installation, a water supply well, and a projected water treating and injection plant are located together near the center of the circle of input wells.

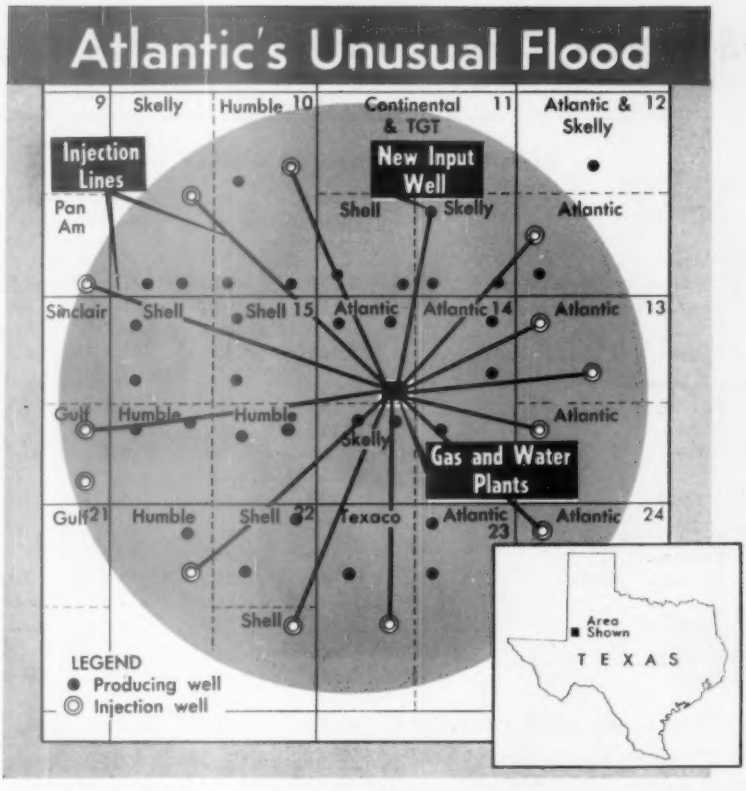
Injection lines radiate out, like spokes of a wheel, from this hub to the input wells. Flexibility is built into the system.

A streamlined dual-manifolding setup will permit the operator to inject either gas or water into any individual well at any time.

Gaining momentum . . . Currently, all 14 inputs are taking propane at rates ranging from 166 to 426 bbl. daily and at injection pressures ranging from 200 to 1,500 psi.

Propane input in a few of the wells will be completed in mid-August. And the unit will begin injecting small quantities of gas into these immediately.

The two big compressors will start service with a capacity for injecting gas at pressures up to 2,400 psi. Pressure will be increased to 4,500 psi. when needed.



Present plans are to build the water plant this winter. This will allow a margin for error in case it should become necessary to inject water earlier than anticipated due to unlooked-for premature breakthrough.

A great wealth of tracer, isoflow, and injectivity profile studies run by the unit failed to turn up any evidence of severe stratification in the Wolfcamp which might lead to any such early breakthrough.

The pay zone is tight around the perimeter and very productive in the center. But the transition, as nearly as the operators can tell, appears to be relatively uniform.

Transfusion needed . . . Block 9 is badly in need of a transfusion. Average bottom-hole pressure now is down to less than 1,485 psi. from the original 3,500 psi.

During the next 2 years operators plan to boost the average pressure to 4,300 psi. and hold it there. At this level, it would be about 800 psi. over the initial pressure.

Total fluid injected during the 2-year period alone will run nearly 8,500,000 bbl. Along with the 250,000 bbl. of propane, Atlantic will inject around 2,000,000 bbl. of water plus a gas volume equivalent to 6,100,000 bbl.

Thus, about three-fourths of total fluids injected will be hydrocarbons.

Atlantic is joined in the Block 9 operation by: Texaco Inc., Gulf Oil Corp., Humble Oil & Refining Co., Skelly Oil Co., Pan American Petroleum Corp., Sinclair Oil & Gas Co., Continental Oil Co., and Tennessee Gas Transmission Co.

Texaco's Fire-Flood Plans Approved

TEXACO INC. has the way cleared to start up soon a new thermal-recovery project in shallow, old Charco Redondo field in Zapata County, South Texas.

The Texas Railroad Commission has approved Texaco operation of two 5-acre inverted five spots under its Anastasio Garcia lease.

The company will inject air through two input wells, apply heat, and continue injection until oxidation reaches the producing wells or ceases altogether.

The reservoir involved is the Cole (Eocene) sand—a formation 160 ft. deep and 15 ft. thick in the project area.

Charco Redondo, a monoclinal type structure, was discovered in 1913. Only 27 of a total of about 200 wells drilled in the field are still producing. They make a total of about 11 bbl. a day. There are no producing wells on the Garcia lease.

The oil is heavy — about 17.5° gravity. Porosity in the area is 32%. Average horizontal permeability is 2,800 md. and the oil's viscosity is 98.7 cp. at 82° F.

Texaco engineers told the commission that the project area is depleted of primary oil, also that there has been no gas repressuring in the area. The company estimates oil saturation at present at 50% of pore space.

In its permit for the project, the commission declined to go along with a Texaco request for a capacity allowable now. It opened the door for possible later approval of this however, when there is evidence of favorable project performance.

Texaco will be permitted to expand the program without special hearing.

New Florida Test

. . . to be drilled by Calco off western coast. It may go below 13,500 ft.

CALIFORNIA Co. has agreed to make a 13,500-ft. test off the west coast of Florida.

The deep wildcat will be located 4 miles seaward of La Costa Island off Lee County, in southern Florida.

Calco will be drilling on a vast 4.5-million-acre lease owned by Coastal Petroleum Co., a subsidiary of Coastal Caribbean Oils, Inc.

Under a 1955 agreement between Calco and Coastal, Calco will earn a one-half interest in the leases by spending $10 million in exploration and drilling or by keeping Coastal's leases in force.

All Florida offshore wells drilled by Calco and other companies have been dry so far, but major producers are still spending money in the area.

The La Costa Island well will be drilled in 18 ft. of water to a minimum depth of 13,500 ft., the second deepest ever tried off West Florida. Calco has not named a drilling contractor or spudding date yet.

La Costa Island is about 25 miles northwest of Fort Myers.

Calco's location will be nearly 150 miles north of the deep test drilled earlier this year by Gulf Oil Corp. in the Gulf of Mexico off Marquesas Key, 35 miles southwest of Key West.

This wildcat, the first in the open gulf waters of the state, was abandoned in April as a dry hole at 15,294 ft.

1959 Analysis: Not Bad, Not Good, but

ECONOMISTS of Chase Manhattan Bank, after analyzing the records of 32 oil companies, say 1959 wasn't such a bad year for the oil industry after all.

It was far from the industry's best, but it certainly wasn't the worst. In fact, it showed an improvement over the year before.

The annual study by the bank's economics staff shows that:

...Net income last year was up 9.3% to $2,692,000,000. It was well under the $3-billion-plus figure for these companies in 1957 and 1956 but it was a shade better than 1955's $2,668,000,000.

...Gross operating income was up 5.6%. All sources returned a somewhat better gross in 1959 than in 1958, but the real big gains were in chemicals, up 32.2%, and natural gas, up 17.1%. Natural gas, which has caused the heating oil end of the business so many headaches, accounted for only 2.9% of these companies' gross.

...Working capital was up $182 million and long-term debt down $105 million.

...Operations generally increased. Production was up 7%, refinery runs 8%, and demand 6%. But these gains were nullified by excess capacity in nearly every phase of the business.

It's plain, therefore, that while 1959 wasn't a year to cheer about, neither was it a year to bewail too loudly. Since the companies involved in this study account for 58% of the production and 62% of refinery runs in the free world, their experience can be regarded as typical.

Unusual year . . . There were several unusual aspects of 1959's financial story for oil.

For one thing, it was a year of exceptional stability in quarterly earnings. The first quarter was the best, $700 million; and the second was the worst, $618 million. That's a swing of only $82 million. For the past 5 years the annual swing from high to low quarterly earnings has averaged $192 million.

The thing that jars most oil men is recollection of the last half of 1956 and the first half of 1957—probably the best 12 months in the history of oil. The 32 companies earned $3.25 billion in that period. That was a full third better than they did in 1958 and 20% better than they did in 1959.

One of the big differences between 1959 and 1958 was a swing in the sources of profit. The so-called "internationals" made only $923 million on their operations outside the U. S. compared to $1.05 billion the year before.

Other indications also appeared in the Chase summary that foreign operations are losing some of their glamor. These companies' domestic operations produced almost exactly twice as much profit in 1959 as did their foreign operations. A year earlier domestic operations were about half again as profitable as operations abroad.

The internationals, too, showed the least improvement among industry groups. The "integrated refiners" enjoyed an 18.8% increase in income for 1959 and "crude producers," 12.8%. The "internationals," however, experienced an increase of only 4.6%.

This is not to imply that foreign oil operations have lost their attractiveness. They haven't. The companies included in the Chase report conducted 8.5% on their operations in the U. S. but earned 13.8% on the investments they have made abroad.

Capital spending . . . These companies cut back capital expenditures last year.

The reduction was not drastic, but was considerably less than had generally been forecast. Capital expenditures of the group in 1959 were $4.26 billion against $4.35 billion in 1958. This was a drop of only 2.1%. Significantly, the companies spent more in the U. S. in 1959 than they did in 1958. Expenditures in the U. S. were actually up 2.2% but were down 11.1% in foreign countries.

The biggest drop in capital expendi-

Expenditures for Fixed Assets

	1959 Million Dollars	1958 Million Dollars	1959 Percent of Total	1958 Percent of Total
Production:				
Crude oil and natural gas*	3,850	3,575	71.0	67.5
Gasoline and cycling plants	150	75	2.7	1.4
Total	4,000	3,650	73.7	68.9
Transportation:				
Pipe lines	135	225	2.5	4.2
Marine	125	125	2.3	2.4
Other	15	25	0.3	0.5
Total	275	375	5.1	7.1
Manufacturing:				
Refineries	350	600	6.5	11.3
Chemical plants	175	125	3.2	2.4
Total	525	725	9.7	13.7
Marketing	450	400	8.3	7.5
Others	175	150	3.2	2.8
TOTAL—ALL DEPARTMENTS	5,425	5,300	100.0	100.0

*Includes only natural-gas producing, transmission, and distribution facilities of oil companies. Includes cost of drilling dry holes and lease acquisitions, but excludes exploration expenses and lease rentals charged to income account.

PIPELINE

Two 30-in. loops are under construction for Texas Eastern Transmission Co. One is a 34-mile loop near Lebanon, Pa. The other, 44 miles, is near Moundsville, W. Va. Contractor is Western Pipe Line.

Transwestern Pipeline has been given temporary authority by the FPC to construct 250 miles of natural-gas gathering lines in West Texas and the Anadarko basin, and three compressor stations. The facilities will cost approximately $8,701,980.

Net income of interstate natural-gas companies for the 12-month period ending in May was $320,511,760, an increase of 20.7% over the previous

a Little Unusual

Investment in Fixed Assets

	Gross Million Dollars	Net Million Dollars	Distribution Gross Percent of Total	Distribution Net Percent of Total
Production:				
Crude and Natural Gas*	31,575	14,850	57.7	54.0
Gasoline and cycling plants	1,600	750	3.0	2.7
Total	33,175	15,600	60.7	56.7
Transportation:				
Pipelines	3,700	2,300	6.8	8.4
Marine	1,150	475	2.1	1.7
Other	375	175	0.7	0.6
Total	5,225	2,950	9.6	10.7
Manufacturing:				
Refineries	8,175	3,875	14.9	14.1
Chemical plants	1,575	975	2.9	3.5
Total	9,750	4,850	17.8	17.6
Marketing	5,600	3,475	10.2	12.7
Others	950	625	1.7	2.3
TOTAL—ALL DEPARTMENTS	54,700	27,500	100.0	100.0

*Includes only natural gas producing, transmission and distribution facilities of oil companies.

tures last year occurred in refining. Refining spending dropped 32.9%. The reason was obvious. Free World capacity stood at 20,465,000 bbl., but runs to stills were only 16,690,000 bbl.

Operations picture . . . The oil companies made substantial gains in production, exploration, and refinery operations.

But these favorable developments were not sufficient to withstand the pressure of excesses. The Chase report points out that:

. . . Spare capacity at the wellhead reached 8 million barrels a day at the close of 1959, about half in the U. S. and Canada and half in Venezuela and the Middle East. Since Free World production was 16,625,000 bbl., the excess available equalled nearly 50%.

. . . Reserves increased markedly in relation to production. Estimated reserves at the end of 1959 were 38 times the year's production. Only 5 years before, reserves were 33 times production. Chase estimates reserves in the Free World at the end of 1959 at 230 million barrels compared to 150 billion 5 years earlier.

. . . Refining capacity of Free World countries added up to 20.5 million barrels per day, an increase of 7.5% from the year before. Since runs were just 16.7 million barrels, at least 3.8 million barrels of unused capacity was available.

. . . Tanker capacity increased more than 10% in 1959, even though many ships were laid up. Free World deliveries of tankers totaled 7,180,000 deadweight tons and, after scrappage and conversions, were enough to bring the Free World tanker fleet up to 59,052,000 tons against 53,547,000 tons a year earlier.

Some gains . . . One encouraging development for oil was the increase in its share of the total Free World energy market.

Petroleum supplied 43.8% of this market in 1959 against 42.4% in 1958.

Petroleum's share rose from 16,760,000 bbl. per day in 1958 to 17,765,000 bbl. in 1959, an increase of 6%. The gain of 9% in foreign demand was enough to bring up the much smaller gain of 4% in the U. S.

The attention oil companies are paying to Europe is well justified on the basis of demand. The four principal European markets, the U.K., West Germany, France and Italy, consumed 2,300,000 bbl. per day in 1959 and represented 27.6% of the Free World market outside the U. S.

BRIEFS . . .

year, according to FPC. Operating revenues in May were $274,162,516, an increase of 19.6% over the same month of 1959.

Contract for a 12¾-in. 55-mile natural-gas loop near Bedford, Ind., has been awarded to Western Pipe Line by Texas Gas Transmission. Completion is expected October 1.

A natural-gas burning turbine is being used on an experimental run in the Corpus Christi, Tex., area to boost well-head pressure to gas pipeline pressure. The 100-hp. turbine is a product of the Garrett Corp.'s AiResearch Manufacturing Division of Phoenix.

Storage of natural gas in Summit gas field, Erie County, Pennsylvania, has been authorized by FPC. Pennsylvania Gas will recondition 46 wells, plug 10 wells, and install a 440-hp. compressor unit at an estimated cost of $1,186,288.

A 30-in. 47-mile natural-gas line in Michigan, from Elsie to Sixlakes, will be started this week for Michigan Consolidated Gas Co. by Williams Brothers.

Continental, DX Sunray, and Skelly will build a 70,000-bbl. products terminal in Bethany, Mo., for handling products from Oklahoma refiners via Great Lakes Pipe Line. Continental is supervising construction and will operate the terminal. Pioneer Oil Field Construction Co., Tulsa, has the construction contract. Completion is scheduled for September.

Trans-Canada Pipe Lines' 30-in. lateral from Winnipeg to Emerson, Man., is now under construction. The 50-mile lateral will deliver gas to Midwestern Transmission for export to the U. S. Contractor is Majestic Contractors.

A decision on Britamoil Pipe Line's proposal to construct two natural-gas product lines is expected from the Alberta Oil and Gas Conservation Board by the end of September. The company plans a $2,655,000 line from Pincher Creek to Calgary and a $1,968,000 line from Rimbey to Edmonton (OGJ, July 18, p. 57).

Boom in Naphthalene Attracting Refiners

• Inability of coking and coal-tar industries to supply fast growing demand has lured Ashland, Sun, and Tidewater into this new petrochemical field. Others may follow.

SOME petroleum refiners will soon take on a mothball aroma. But the cause will be their rise as major suppliers of naphthalene and not because their plants have been "mothballed."

Growing demand for naphthalene, combined with the inability of the coking and coal-tar industries to produce regular supplies, has opened the door for petroleum-produced naphthalene. Three refiners already have moved into the field, and a few more likely will follow.

Ashland Oil & Refining Co.'s plant will be the first completed. Its 75-million-pound per year plant at Catlettsburg, Ky., is due to go on stream next February. Sun Oil Co. late next year will complete a 100-million-pound unit at its Toledo, Ohio, refinery. About the same time a 50-million-pound plant, jointly owned by Tidewater Oil Co. and Collier Carbon & Chemical Co., will go on stream at Tidewater's Delaware City refinery (OGJ, June 20, p. 84).

Sun last week announced it had let contract for its $8,000,000 plant to M. M. Kellogg Co., with construction scheduled to start next spring. Site preparation will start this fall.

Regular sources slipping . . . Historically, the coking and coal-tar distilling industries have been the source of naphthalene.

These supplies have been falling off as the steel industry became more efficient and required less coke. Steel strikes and fluctuations in steel-industry activity also led to chronic shortages and high prices.

Imports likewise have been declining as demand abroad increased. Last year only some 59 million pounds were imported compared with 122 million in 1955. Based on the first 2 months' record, even less will be imported this year.

Naphthalene is used principally in the manufacture of raw materials for the plastic, rubber and dyestuff industries. Of the domestic production, between 80 and 95% now goes into the synthesis of phthalic anhydride.

Advantages . . . Petroleum-produced naphthalene will be a purer product than that supplied by the coal industry.

This alone will make it more desirable to phthalic anhydride producers, particularly those using the fluid-bed process. Impurities in coal-produced naphthalene caused catalyst poisoning and decreased selectivity.

In the pricing area, refinery naphthalene will be more than competitive. Currently refined coal-tar naphthalene is priced at about 11.75 cents per pound and the phthalic-grade (74°-78°) at 6 cents. Last year the average price of the latter grade was 5 cents plus shipping charges.

None of the refiners has announced a contract price for his product. A spokesman for one company, however, said his company's long-term contract calls for a price below that received for the phthalic-grade material last year.

Process used . . . Catalytic hydrodealkylation will be used at all three plants to convert alkyl naphthalenes into high-purity naphthalene.

Individually developed synthesis processes are being used, however, and the various companies are not releasing any "know-how" data.

In Sun's plant, a catalytic gas oil will be used as charge stock. In the Tidewater-Union and Ashland plants, it is believed catalytic reformer bottoms will serve as feed.

According to a Sun spokesman, the charge used at Toledo will be a narrow boiling-range cut taken near the gasoline-gas oil cut point. After preliminary processing, it will be hydrodealkylated at elevated temperatures and moderate pressures.

The product will move to market as a liquid, using steam-heated tank cars and tank trucks.

More coming? . . . The combined output of the three announced plants will amount to about one-half the domestic coal tar industry's present production.

All the companies have stated they have long-term contracts for their output, so there is a good chance other oil companies will enter the market.

Union Oil Co. has admitted it is considering a plant for the West Coast, because of the expanding market for phthalic anhydride in that area. Industry opinion, however, is that bulk of the petroleum naphthalene plants will be built close to the principal market—in the general area of the old coke and coal-tar plants.

Other results . . . The shortage of naphthalene also is having repercussions in other branches of petrochemicals, especially in orthoxylene production.

Humble Oil & Refining Co. has announced that it will expand capacity of its Baytown, Tex., plant by the end of this year. Old capacity of 44 million pounds will be increased to 72 million.

Both domestic and foreign phthalic anhydride producers in recent months have turned to orthoxylene to supplement their raw-material supply.

Barge Owners Feel Use Charges Will Cut Oil Business

BARGE OPERATORS told members of the Senate Commerce Committee last week that barges will lose their oil-products business to pipelines, if proposed user charges are adopted.

The American Waterways Operators, Inc., attacked the new use charges, suggested by railroads, at a meeting in Washington of a study group of the Senate committee.

The operators said petroleum represents a third of the ton miles on the waterways, and added:

"Barge movements of petroleum and petroleum products are closely competitive with pipeline charges. Thus, the initial impact of the proposed user charge would involve the extinction of more than one-third of present inland waterway traffic volumes."

Shippers "would be forced" by the new charges "to shift to pipelines in order to preserve their markets," the operators said.

Port Neches Strikers Return

STRIKERS at Jefferson Chemical Co.'s Port Neches, Tex., plant returned to work last week after a walkout of 2½ months.

The 450 strikers, members of the Oil, Chemical and Atomic Workers Union, agreed to stay on the job for at least 30 days while the union and the company try to write a new labor contract.

Issues in the strike have concerned work conditions, the size of the labor force for certain units, and pay classifications.

There's good material and plenty of it in these packing elements. (Note the big holes—big because the packer bores are big and unrestricted.)

TWO BASIC MODELS

Model J (Product 756-J) is long-string set. Model K (Product 756-K) is short-string set. Both come with or without hold-down buttons (double or single grip). The picture shows double-grip Model J.

How to make a dual-string hookup that works

Required: a dual packer that works

NOTHING DEFEATS THE ECONOMICS of a dual completion like a dual packer that leaks. You must have a positive and dependable packoff.

It's fundamental—to make a dual string hookup work, you must have a dual packer that works, one that packs off and holds. That, many operators state plainly, is the reason they are using the new Baker duals.

WHAT MAKES THE PACKOFF SO POSITIVE? The reasons are designed into the simple and rugged 3-element packoff mechanism you see in the pictures.

There's been a lot of favorable comment on this design. It holds so well it doesn't need the non-retractable metallic back-up rings that so often stick to the casing and defeat retrievability. The 3-element concept came out of a tough proving ground. It was adapted from Baker's high-performance retrievable squeeze packers, proved in thousands of high pressure downhole operations.

BUT WHEN YOU'RE MAKING THE HOOKUP, you discover that while a positive packoff is essential, it isn't everything. You must have flexibility, too.

When you want to space out, to test packers before displacement—that's when you discover the importance of a packer that offers repeat setting.

A BAKER SNAP-SET DUAL is one packer that gives you both pressure holding power and flexibility. You set and pack off by setting down minimum weight—and the packer holds. You release by picking up.

It's just that simple. You don't pressure, you don't rotate, you don't drop balls—and you don't come out of the hole to re-cock.

You set and unset as many times as you need to. And when your hookup is made, you've got one that works.

BAKER SNAP-SET DUAL PACKERS

BAKER

BAKER OIL TOOLS, INC.

HOUSTON LOS ANGELES NEW YORK

49 PAGES OF FACTS

With big pictures and few words, a new brochure tells the interesting engineering facts about Baker's new Snap-Set Dual Packers. Get it from Baker representatives, or write to Baker Oil Tools, Inc., P.O. Box 2274, Terminal Annex, Los Angeles 54, California.

New Trend: Slash Costs by Buying Only

• Faster delivery of items, high cost of tying up money in inventories are behind the new drive to save money by watching stocks. Another idea proposed for oil companies: Trade inventory lists and buy from each other.

Merle Blakely
District Editor

A NEW inventory policy in the oil industry has taken shape in the last few months, prompted by the drive of management to free as much cash as possible for operating funds.

The trend has been apparent in oil-company purchasing for the last 2 years, but the tendency to keep a tighter lid on materials inventories has become more pronounced since settlement of the last steel strike.

The result now is that more and more companies:

. . . **Keep on hand** only a 30 to 45 days' supply of steel goods and other supplies which might be scarce when needed in their operations. The old margin usually ranged from 6 months to a year of inventory.

. . . **Order supplies** delivered straight to the job in many instances.

. . . **Cooperate** in regional inventory exchanges. A plan involving voluntary "swapping" of equipment or supplies needed in an emergency is under study by oil purchasing agents. Object is to eliminate duplication of rarely used items of inventory by firms operating in the same area.

Why the move . . . Stocks of supplies in oil-company warehouses and yards are being lowered sharply to meet the new concept.

The old idea of having on hand for months all materials needed in a drilling program, in producing operations, or in other activities is a thing of the past. This even is true for manufacturing operations in a few cases.

Operators have concluded this backlog was a luxury. They cite two big developments which have forced them to purge inventories:

. . . **High cost of money.**

Millions of dollars in the past have been tied up in pipe and other equipment, much of it idle for 6 months and longer. Some of the equipment never saw operational use. With interest on money and other costs mounting and income often being restricted, company managers were forced to consider the cost of carrying so much idle equipment. The money was needed too greatly in other phases of the operations.

. . . **Quicker delivery** of supplies.

Supply companies, now that the steel-strike troubles have ended, are promising operators delivery within 24 to 48 hours almost anywhere in the country. The industry's supply line has been speeded up tremendously by mill, river, and warehouse stocks, new barging facilities, and around-the clock trucking.

Even the stocks of deep-well tubular material, such as that used in offshore work, have been pruned. Since these goods are not as readily available, the cutbacks have not been so sharp in this area.

The usual formula for companies cutting corners on inventory is this: Live off inventories as long as possible. When new goods are needed, order from the mill, river, or supply-firm stocks specifying quick delivery. Examine stocks of little-used items or of items which have no further use and sell surplus items to other operators. Educate the field men on the necessity of ordering closer to time of need and not carrying heavy inventories.

The payoff . . . An example of what is happening is the campaign of Continental Oil Co.

Continental has cut its tubular-goods inventory to the lowest point in 3 years and its warehouse stocks of other items to the lowest point in 10 years.

This has taken place in the last 4 months following a planned buildup of goods during the first half of 1959. Stocks tumbled by one-third in a few months and the program of inventory reduction is continuing.

D. W. Sims, general purchasing agent of Continental at Ponca City, says:

"We've never caused a delay in operations, as far as we know. To do the job of inventory reduction and maintenance of minimum stocks requires close cooperation between purchasing and operating departments.

"We have that kind of teamwork, and it pays off. It's my guess we'll never go back to the old system."

Continental has set up a road-block to accumulating new inventories. The purchasing department has final say in buying—except for some refinery items. But more important, no major item can be shuttled to inventory on the company's books until the purchasing department has screened and approved the action.

The company also is rearranging its remaining inventories, spotting the stocks nearer areas where they will be used. The purchasing department arranged for transfer of more than $1-million worth of material from idle status in one region to use in another. It proved cheaper to pay shipping, labor, and packing costs than to buy new material for the area.

Continental has picked up $2,250,000 in the last year from another phase of the inventory program: Sales of surplus and obsolete equipment. The stocks have been sold either for use by other companies or for scrap.

The stakes have become so high on the inventory program that Sims' purchasing department at Continental has set up a watch-dog plan. A staff member makes regular visits to all division points four to six times a year. He inspects the yards, warehouses and storerooms, consults with superintendents or foremen.

Sims reports that almost every week a batch of valuable idle equipment or supplies is brought to light. Even the detailed monthly and quarterly inventory reports from field men had not reflected the depth or extent of these items.

This tightened inventory program has freed about $3 million for other uses in Continental's operations, plus the $2.25 million realized from sale of surplus items. This is important money for a firm that spends upwards of $90 million annually in new purchases.

Union's drive . . . Union Oil Co. of California is another firm which has declared war on heavy inventories. It has ordered its inventory cut in half across the board.

C. S. Perkins, manager of purchases, issued this statement to all departments in the company:

"With all materials we purchase now readily available, the purchasing department urges a reduction of inventories, which were increased considerably during the steel strike.

"A 50% reduction is recommended and can be attained through cooperation of all operating departments."

The suppliers' views . . . The inventory

What's Needed Now

whacking is adding slightly to woes of supply firms also hurt by a slowdown in industry operations.

Oil firms generally are just buying less of nearly everything. Big orders are increasingly hard to get.

The trend toward buying closer to need, however, fits recommendations supply people have made for years. The move should eliminate hoarding and place industry buying on a more stable basis. Thus the buying peaks and valleys would be ended.

Says one supplier: "That has been our philosophy all along. We've tried to sell company people on relying on us to deliver goods anytime. We can handle storage and get what they need to them and when they need it. It's just as simple as a telephone call."

Cooperative exchange . . . A remedy for useless surpluses has been suggested and is under study by an industry committee.

It calls on companies to participate voluntarily in an exchange of equipment information, listing surplus materials being held in inventory.

It is a new committee of the Petroleum Industry Buyers Group of the National Association of Purchasing Agents. It will report on its inventory studies, and make recommendations, during the API annual meeting next November in Chicago.

To date, the committee has:

. . . Drafted a unified reporting form for obtaining manufacturers' data on recommended spare parts.

. . . Done exploratory work developing uniformity in numerical spare parts identification.

. . . Studied inventory-reduction proposals emphasizing greater reliance on area stocks carried by manufacturers or private companies.

A typical problem, as posed by the committee, shapes up like this:

One refiner in the Chicago area has $1,000,000 in spare parts on shelves or in yards. This reserve stock is essential, on a standby basis, in case sudden replacements are required. If other refiners in the area must keep similar spare parts on hand, the over-all inventory cost is multiplied many times.

Voluntary setup . . . The committee's program, providing regularly published listings of on-hand materials by each company, would be nonexclusive as to any manufacturer or user of equipment.

In effect, any participating company needing a part listed by another firm could request it.

The agreement to list items would not bind a company to release materials on request. Each exchange would be handled individually between companies involved.

To date, the inquiry has concentrated on spare parts for major mechanical units, such as centrifugal pumps, centrifugal and reciprocating compressors, steam and gas turbines, and centrifugal blowers.

The committee has circularized scores of companies. It believes systems of classifying, cataloging, and stocking of parts used can be correlated or simplified.

By regular reports, the companies also would know of area stocks kept by manufacturers or independents.

Some are leery . . . Quite a few company representatives insist the plan has merit and will work.

Others swear it is unworkable, that no operating company would rely on a "paper-pool" supply for emergency needs, and that a few companies would carry the brunt of major backlog expense.

Even the doubters, however, say equipment listings could be a big money-saver and work efficiently in local areas or on a restricted basis. Some have urged sectional tests of the plan on the Gulf Coast from Corpus Christi to New Orleans; the Mid-Continent, the West Coast, and perhaps in a manufacturing concentration on the East Coast.

Oil-industry purchasers spearheading the study say they do not expect overnight answers or results. Their idea is a long range, trial and error program to help companies whittle inventories.

Gayle Hawk, Shell Oil Co., New York, is chairman of the oil buyers study committee. H. C. Cowdery, Cities Service Oil Co., Bartlesville, and K. V. Dale, Signal Oil & Gas Co., Los Angeles, are vice chairmen.

L. E. Schaffer, Standard Oil Co. (Ind.), Chicago, recently took over as chairman of the NAPA's inventory utilization committee. Chairman of the original committee, set up less than 2 years ago, was T. C. Banta, Sinclair Oil Corp., New York. The Hawk-Schaffer groups are teamed in the over-all industry effort.

"The API recognizes us," Hawk says. "They give us a place on their program and we work with them. While we are not a unit of the API organization, we work closely with interested members in their producing and other sections."

"Such a group never could engage in organized buying of materials—that definitely is taboo," said Hawk. "However, if our work in the early stages results only in standardization of nomenclature and numerical identification of materials, we feel it will be well worth while."

The independent actions of Continental, Union, the Buyers Group, and many others working on the problem emphasize the new trend: Oil is streamlining its shopping methods. The "short-shelf" supply pattern may be here for keeps.

Union Election May Be Voided

Election of the president of the independent union at Esso Standard's Bayway refinery, Linden, N. J., last February may not be valid.

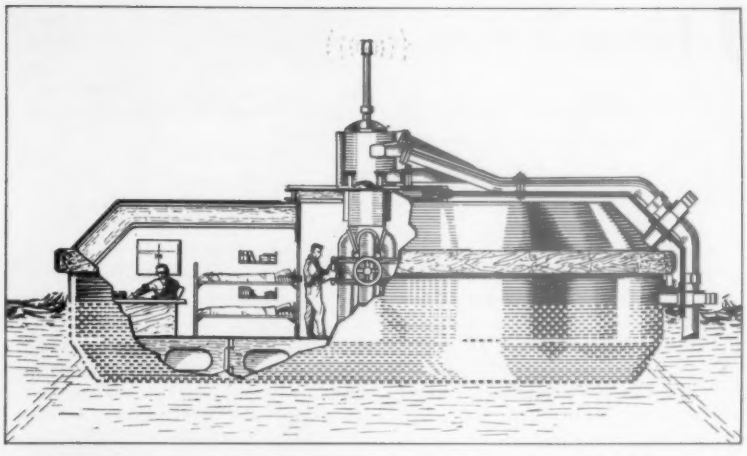
Secretary of Labor James P. Mitchell has filed suit in the Newark, N. J. federal court to void the election in the first such action taken under "clean election" provisions of the Landrum-Griffin Act.

The Independent Petroleum Workers Union had returned John J. Coppa to office as president at Bayway in a close election. Coppa received 287 votes, his opponent, John Sullivan, received 203. The government has asked for a new election, supervised by Mitchell.

Mitchell took action after hearing complaints from the losing candidates. Their petition alleged that the number of ballots printed was "substantially in excess" of needs; that ballots had been removed from the printer's package before it was time for them to be mailed; that the union's post office box to which ballots were mailed was accessible to anyone with the combination, including the winning candidate; and that ballots were taken out of the union box before observers for the losing candidates arrived and before the time agreed upon.

Mitchell told the court that these were violations which may have affected the outcome of the election. He asked the court to bar union officers from selling, transferring or otherwise disposing of any property until the case is settled. The union has 20 days to reply to the complaint.

In another union action involving Esso, independent tanker men turned down a bid for representation by the Seafarers' Union affiliate by a vote of 681 to 384.



DEEP-WATER unit which swings 360°, loads or unloads tankers is this . . .

IMODCO Buoy to Be Erected in Italy

FIRST commercial use of the IMODCO buoy will be made by the SAROM Refinery at Ravenna, Italy.

The tanker loading and unloading device will be anchored 5.4 nautical miles offshore in the Bay of Ravenna to serve tankers discharging crude to the 48,000-bbl. per day refinery.

The buoy will handle vessels up to 100,000 tons total displacement, but first use will be with 70,000-ton tankers. It will be in operation October 31.

The device, firmly anchored to the floor of the bay, will hold vessels in a wind velocity of 80 knots plus a 4-knot current. Since the vessel can swing 360° around the buoy, these forces can be minimized by heading the tanker into the wind or current.

Completion time of less than 6 months and low cost are claimed for the new device by its builders, AB International Marine and Oil Development Corp. of Stockholm. Tankers can load or discharge several streams simultaneously through the buoy with the vessel swinging free.

Shell Brand Bounces Back

Shell Oil Co., which was knocked out of the West Texas-eastern New Mexico marketing territory last year, has gone back into the area in a big way.

Shell lost its 30 outlets when Continental Oil Co. bought Shell's jobber, Westex Oil Co.

Last week Shell had six newly built stations and two remodeled ones in Midland and Odessa. These were added to stations opened earlier in six other cities in the territory. Still others are under construction.

Shell's present jobber is Fidelity Oil Co., Odessa, formed last October to handle the Shell business. J. W. Starr, Midland, is president.

New Depth Record

. . . in Oklahoma possible if Caddo test produces.

OKLAHOMA may have a new producing-depth record at 19,654 ft. in the Hunton Siluro-Devonian. The well could also become the world's second deepest producer.

This possible record breaker is Kenneth A. Ellison's 1 Miller-Long unit, in Section 4-9n-12w in Caddo County, 1½ miles southeast of now-abandoned East Eakly pool.

The well is a revival of the Howell & Howell 1 Anadarko Basin, abandoned a year ago at 21,021 ft. (OGJ, Aug. 10, 1959, p. 76).

The operator reported the well flowed 750,000 to 1,000,000 cu. ft. of gas from open hole in Hunton perforations at 19,491-19,654 ft. Testing was continuing.

If the well should be completed successfully, it would break the old Oklahoma record held by British American's 1 Krieger in Knox field, Stephens County, at 16,546 ft. in Oil Creek Ordovician sand.

The world's deepest producer is the Richardson & Bass et al. 1-L Humble LL&E in Plaquemines Parish, Louisiana, at 21,443 ft.

NDUSTRY BRIEFS . . .

A Texas legislative study committee last week began hearings aimed at developing a state policy on leasing of highway rights-of-way for oil and gas development. Such leasing has been deferred pending adoption of a policy by the legislature. Testimony during the hearings will be given by spokesmen for the Highway Commission, farming, ranching, oil, and other interests.

Northern Oklahoma Gas Co. has been merged with Oklahoma Natural Gas Co. The merger agreement called for exchanging four-fifths of a share of ONG common for one share of NOG common. Northern Oklahoma Gas has 13,000 residential, commercial, and industrial customers in Ponca City, Newkirk, and Perry. The largest industrial customer is Continental Oil Co. which operates a refinery at Ponca City.

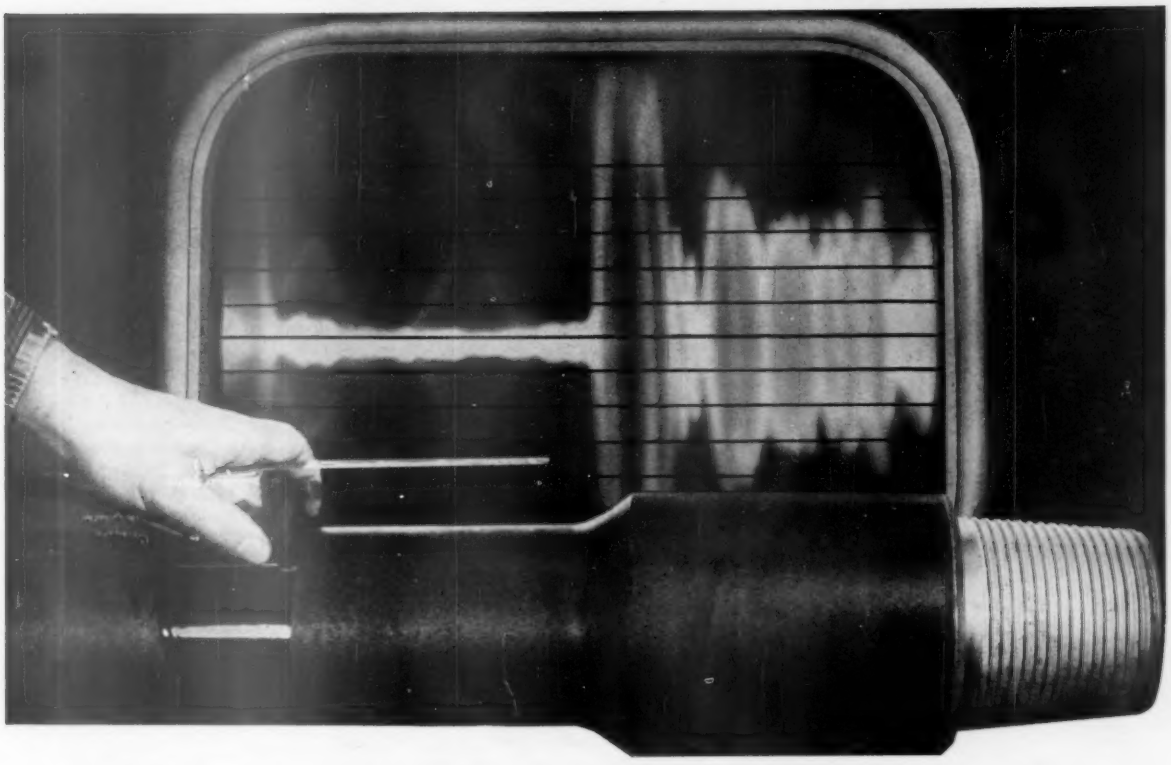
Proration will end in August for North Dakota's northern marketing district after Great Northern Oil Co. announced it will take 6,000 bbl. daily of North Dakota crude for its Pine Bend, Minn., refinery. Market demand for North Dakota crude hit an all-time high of more than 66,000 bbl. daily during July. That's 3,000 bbl. daily higher than the previous record.

MJM & M Oil Co., Bakersfield, Calif., plans to take over Fortune Petroleum Corp., Burlingame, Calif., in a share-for-share stock swap. MJM & M acquired control of Fortune last year. Fortune has about 200 bbl. daily production in the Santa Maria area of California.

The battle over Texas' controversial severance-beneficiary tax on natural gas will enter the second round November 30. That is the date set by the Third Court of Civil Appeals in Austin to hear an appeal by the state from a district court ruling holding the tax unconstitutional. Meanwhile, Will Wilson, Texas attorney general, has hiked estimates of the yearly yield from the tax to $9,000,000 from the previous estimate of $7,500,000.

One of the Midwest's largest service stations is going up in suburban St. Louis. Midland Oil Co., distributor for Lion Oil in the area, is building the 9,280-sq.-ft. station and car wash building on a three-acre site. The station will have 16 pumps and 5 service bays. Car wash capacity will be 2,000 cars daily.

How an electronic signal



assures maximum performance for AMERICAN IRON *Flash Welded* Tool Joints!

One of the newest innovations in non-destructive testing apparatus . . . the reflectoscope . . . is used by American Iron to inspect the weld zone for inclusions or defects.

The inspector slowly rotates pipe while holding a high frequency crystal to the exterior. This allows the emitted signal to enter the pipe. The signal bounces off the I.D. at an angle, and returns to the O.D. and then back to the I.D., eventually passing through the weld zone.

If any inclusions or defects are present the return signal will be shown on the screen. The joint is then removed and another joint is welded on.

This electronic check on the weld zone assures maximum performance for American Iron Flash Welded tool joints. Another reason why you buy QUALITY when you specify AMERICAN IRON.

Specify Flash Welded OPEN-HOLE Tool Joints for your Lightweight Drill Pipe.

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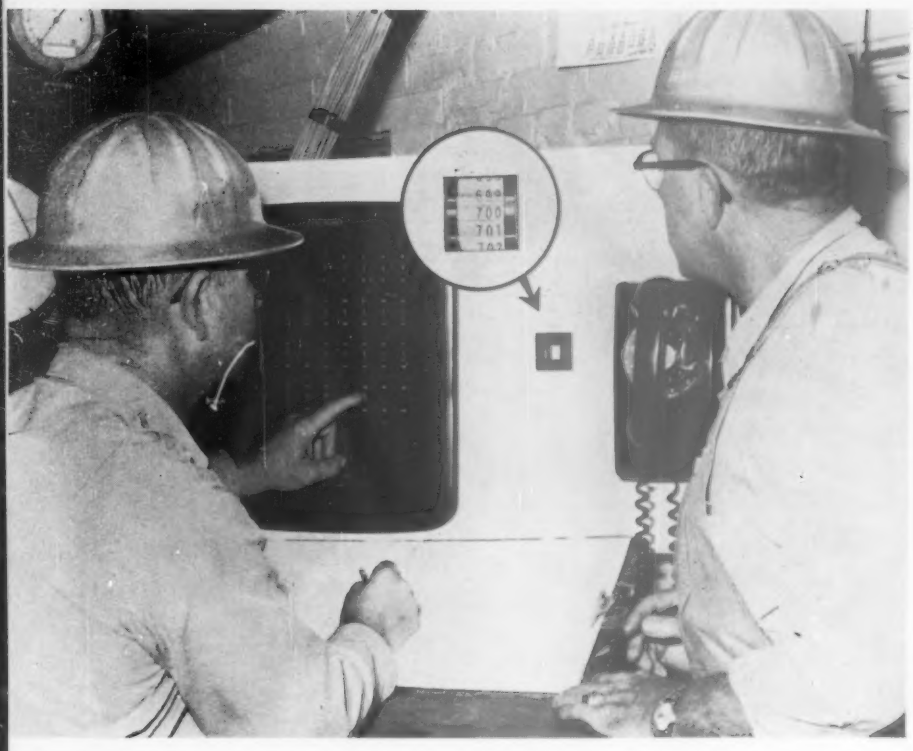
PHOTOS IN THE NEWS



Just Punch a Button

AN OPERATOR in DX Sunray's Duncan, Okla., refinery can check crude-oil temperature at any of 50 points in the No. 2 crude unit, merely by punching the appropriate button. And, as the inset shows, he gets a precise numerical reading. The indicator, first of its kind installed, has been under test at the Duncan refinery 14 months. The temperature indicator was developed by B & H Instrument Co., Inc., Fort Worth.

Signal's New Home

LOS ANGELES' Harbor Freeway is a fitting foreground for the new home of Signal Oil & Gas Co. Traffic on the busy eight-lane freeway probably consumes as much gasoline as on any roadway in the country. Signal moved into the 16-story building at 1010 Wilshire Blvd. last Monday after a 'round-the-clock move during the weekend. Moving into the new building ends a 30-year stay in the Haverstrite Building about 5 blocks away.

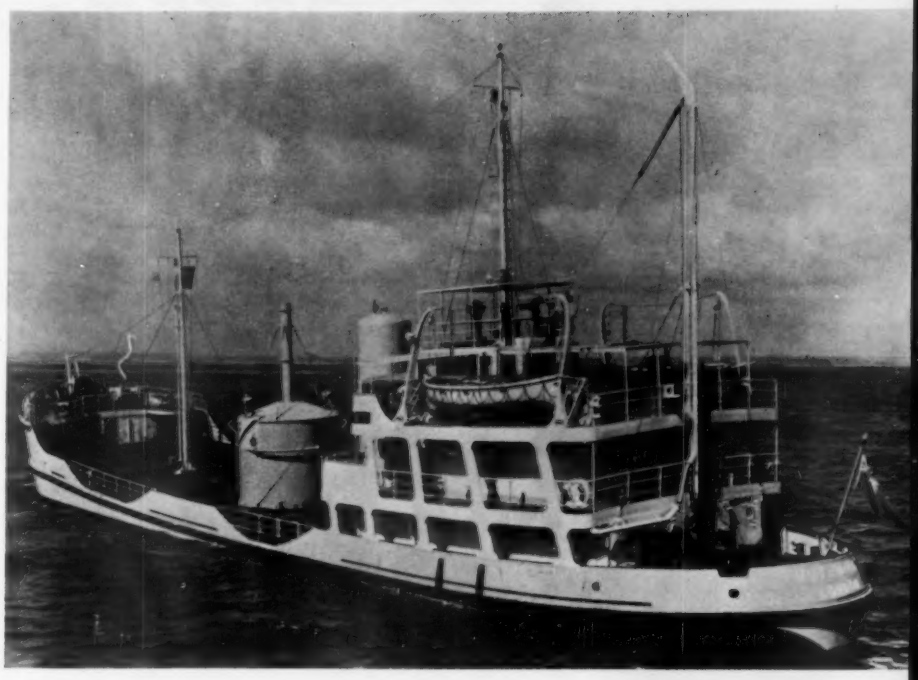
Seagoing Separator

THE CRAFT at right is BP Tanker Co.'s answer to the problem of handling production tests of new wells completed in Umm Shaif field, 20 miles out in the Persian Gulf.

Crude is brought aboard through a flexible pipe coupled to the wellhead. Oil flows from the 7 by 27-ft. separator into the 14½ by 15-ft. flow tank. Gas is flared through a pipe extending 20 ft. off the stern.

The 180-ft. craft was designed for Abu Dhabi Marine Areas, Ltd., whic' is developing the offshore field.

Because there are not yet any shore facilities for taking crude, produced oil is being returned to the formation.



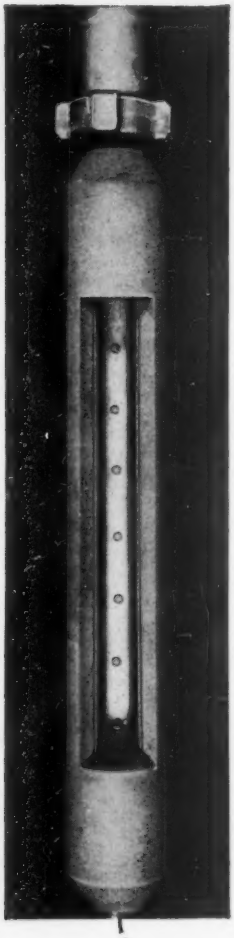
Floating Fueler

THIS ODD-LOOKING craft has an unusual purpose—to service towboats as they move their strings of barges up and down the Mississippi River. It's Sinclair Refining Co.'s Midstream Fueler No. 1, which carries 126,000 gal. of fuel, a complete line of marine lubricants and provisions, and 10,000 gal. of water. Tall pilot house gives an eye-level vision 22 ft. above water.

NEW

HALLIBURTON SAND SCREEN

combats trouble where it starts!



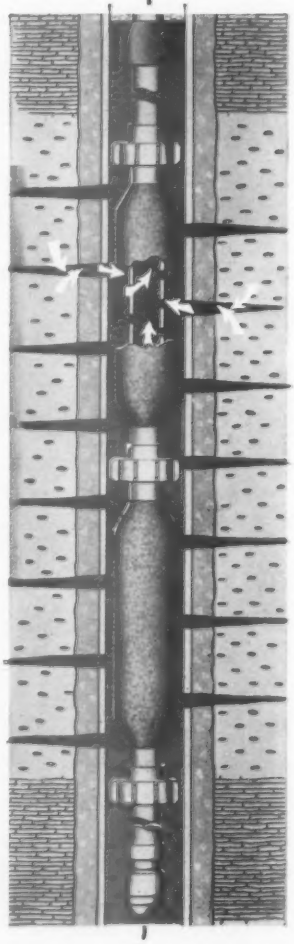
If you've been fighting a losing battle against formation sand, here's a new tool that may solve your problem.

We've cut a window in the Sand Screen pictured on the left to show you its construction. The regular screen is provided with conventional perforated tubing, as shown ... slotted type tubing is also available. That's the inside story, but the big news is on the outside.

The pre-formed screen, bonded to the inner tube, is made entirely of *consolidated sand* ... acts as a natural buffer ... is inert and compatible with most producing formations. The greater flow area provided by the sand facing tends to diffuse suspended formation sand, as shown on the right, rather than have it concentrate and restrict entry points. The bonding agent is a thermo-set resin, giving extremely high compressive, shear and tensile strength to the sand jacket – while still retaining 26% porosity over the entire face of the liner and a permeability of 23 darcies. Extensive field testing has shown beneficial results in wells with very difficult sand problems.

Halliburton Sand Screens are 6 ft. in length and are available in popular sizes for running in 4½", 5½", and 7" O.D. casing ... may also be run in open hole.

Your Halliburton man has complete details about this latest advancement from Halliburton Research ... he'll be glad to explain *Sand Screen* to you.



HALLIBURTON COMPANY

275 SERVICE CENTERS—JUST MINUTES AWAY FROM YOUR WELL DUNCAN, OKLAHOMA

Brown Creek Joins List of Foothills Fields

THE NAME of Brown Creek is being added to the growing list of potential gas-producing fields in Alberta's elongated Foothills belt.

The wildcat at Brown Creek in west-central Alberta 130 miles northwest of Calgary is a possible dual producer in the Mississippian.

One test flowed 2,500 M.c.f. daily, and the other in a higher zone flowed 4,800 M.c.f. daily.

Owner of the well is the Central Foothills Agreement Group, including Triad Oil Co., as operator, British American Oil Co., Sun Oil Co., Royalite Oil Co., and Mobil Oil of Canada.

More testing . . . Before the well's potential is fully known, further testing will be necessary. On the basis of current results, commercial production is indicated.

The wildcat originally was spudded March 15, 1959, as Triad et al. 6-20 Brown Creek located on LSD 6, 20-44-17w5. It was suspended at 810 ft. in mid-April of that year, and drilling wasn't resumed until March of this year.

Drillers carried the well to 14,242 ft. total depth. Drill stem tests failed to indicate production on the way down, but logs of the hole, upon completion, indicated further testing was warranted. As a result, a 7-in. producing string was run to 13,425 ft.

The first section of the Rundle zone in the Mississippian appeared at 10,700 ft., the second section at 10,910 ft., and the third at 13,833 ft. Intial tests of the lowermost zone gave insignificant showings of gas. The second zone at 10,928-11,004 ft. flowed 2,500 M.c.f. daily. Satisfied with these results, operator set bridging plug and moved up hole to the first Rundle section. Perforations at 10,718-10,816 ft. flowed 4,800 M.c.f. daily through ¾-in. choke, dipping to 2,800 M.c.f. through 19/64-in. choke. Testing will still continue.

Successes . . . The Central Foothills Agreement Group has three previous discoveries from 10 wildcats drilled in the Foothills belt gas trend.

The other strikes were:

. . . B. A.-Triad et al. 12-30 Lovett River, a 12,500-ft. wildcat that made 24,500 M.c.f. daily 2 years ago.

. . . The 5-36 Mountain Park, a 1956 discovery in Mississippian at 11,200 ft. flowing 13,000 M.c.f. daily.

. . . The 6-10A Stolberg that went to 13,706 ft. 3 years ago and was capped as a potential gasser before being fully tested.

In addition, the first offset to Lovett River was an extension discovery. Still being drilled is the 12-7 Kaydee, currently at 11,500 ft. with a goal of 14,500 ft.

Large block . . . The syndicate originally controlled about 1.3 million acres.

This has been trimmed to 400,480 acres under lease and 492,760 acres of reservation. The lands are generally within Townships 35 to 52 and Ranges 11 to 265, except a relatively small block in southwestern Alberta around Township 13, Range 2w5. This irregular-shaped tract follows along the eastern edge of Banff and Jasper national parks.

Interest in the project is now split 20% to Triad, 30% to British American, 25% to Sun, 15% to Mobil, and 10% to Royalite. Mobil entered the project by purchasing part of Royalite's interest for a $2.5-million cash bonus plus interests in 36 oil wells in southeastern Saskatchewan.

PROCESSING BRIEFS . . .

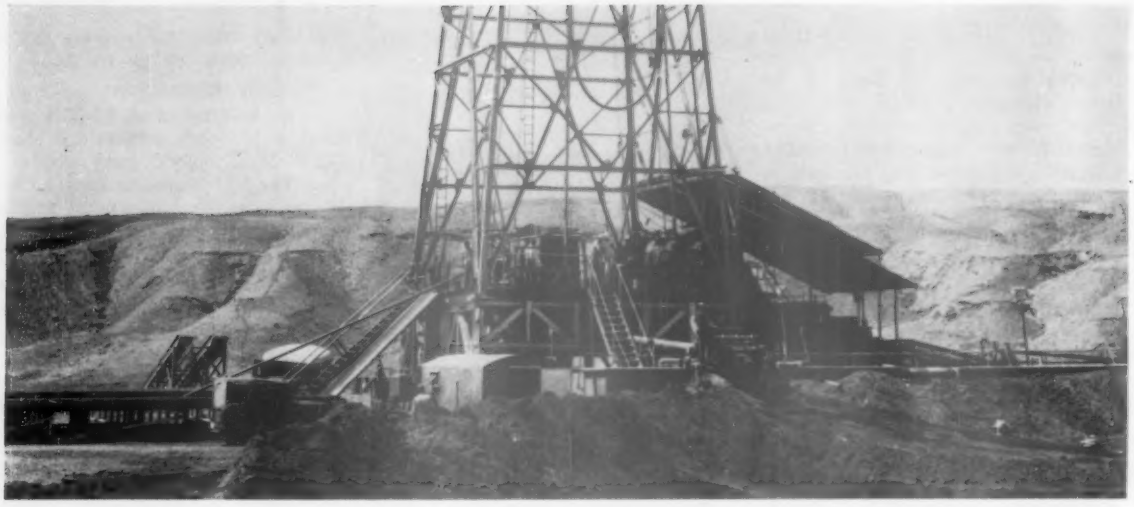
Odessa Natural Gasoline Co. and Warren Petroleum Corp. will begin construction in mid-August of a new gasoline plant in the Azalea Strawn and Devonian gas-distillate area in Midland County, West Texas. The plant will have a maximum processing capacity of 20,000,000 cu. ft. daily. Residue gas will move through a 20-mile, 6-in. line to petrochemical plants at Odessa.

California Spray-Chemical Corp. will build its first midwestern fertilizer plant at Fort Madison, Iowa. The plant will have a daily capacity of 1,050 tons of fertilizers, producing 150 tons of ammonium nitrate, 300 tons of anhydrous ammonia, and 600 tons of complex fertilizers. Feedstock is expected to be barged to the plant, which will be located on the Mississippi River. Construction contract has not yet been awarded. Calspray is a subsidiary of Standard Oil Co. of California.

El Paso Natural Gas has announced plans to enter the field of automotive and industrial lube manufacturing and marketing. The company will market five motor oils at El Paso-Dixie service stations. Industrial lubes will be available at El Paso district warehouses in the five-state marketing area.

International Institute of Synthetic Rubber Producers has been formed by 15 U. S. and foreign synthetic rubber producers to promote international trade of synthetic rubber and to act as a forum for the exchange of technical information. Bancroft Henderson, retired president of American Synthetic Rubber Corp., has been named managing director. Headquarters will be in New York.

Twin lube-oil units, each with a capacity of 6,500 bbl. daily, will be constructed at Gulf's Port Arthur refinery. The Gulfinishing process will be used. The units will be able to handle a dozen different feed streams from existing operations. Construction contract has been awarded to Bechtel Corp. Completion is expected in the spring of 1961. Gulfinishing, a new hydrogen-treating process, was jointly developed by Gulf Research & Development and Gulf Oil. Catalyst used in the process is still secret.



THE BIG RIG that gentled Alborz field had to fight salt anhydrite, red plastic marls and high pressures.

Mighty Alborz Structure Is Finally Tamed

● Eighth test in this Iran field, which has had two of the wildest blowouts in modern oil history, pays off with a flow of 20,000 bbl. daily. Success boosts nation's hopes for this 30-mile-long, high-pressure anticline.

IRAN has tamed its tiger oil field.

After 9 years of drilling with definitely mixed results, it is now apparent that Iran Oil Co., the government-owned exploration company, not only has leashed the big Alborz structure but has it purring like a kitten.

Alborz 8 is being completed as a 20,000-bbl. daily well producing from an interval tested at about 10,500 ft.

National Iranian Oil Co., parent of the exploratory firm, disclosed the latest test results on the central plateau well last week with obvious relish. Proving Iran's central plateau as a crude producing area has not been an easy job and it has taken a lot of time.

Finding the secret of making Alborz produce could mean complete oil independence for the populous region of northern Iran—independence even from the country's own southwestern producing fields now being operated by the international consortium of European and American oil companies.

With the consortium fields producing more than 1,000,000 bbl. daily, Iran has no difficulty meeting its fuel and energy needs. But with local demand increasing at 14% a year and most of the increase in the Tehran region to the north, transporting fuel to consumption areas is getting to be more and more a bottleneck.

If Iran can meet its expected consumption of 100,000 to 120,000 bbl. daily in 1963 with Iran located and Iran-refined oil, a big segment of national pride that still suffers just a bit from the failure of the 1953 nationalization will blossom all over again.

Exporting oil from Central Iran, especially with the worldwide surplus that exists today, is something else again.

The Alborz wells . . . Establishing commercial production at a rate more than respectable even by Middle East standards marks the end of a long and troubled first chapter for Alborz, located just 70 miles south-southwest of Tehran, the country's capital.

Alborz 5 furnished modern drilling history with its most spectacular blowouts just 4 years ago this month. This well was the first drilled on the big 30-mile-long structure to reach the Qum limestone objective, and the results were disastrous. The well drilled less than a foot into the limestone when it blew out August 26, 1956.

The well blew wild until November 18, producing an estimated 5 million barrels of oil before it bridged and shut itself in. During a prolonged period of control it was flowed through

a 4-in. line at well-head pressure of 1,800 psi. and the flow was burned, away from the wellhead.

Alborz 5A was drilled just 1,600 ft. away, but when the well encountered high pressures at about 7,800 ft. the well was shut down. It still sits idle.

Two subsequent wells, No. 6 and No. 7 drilled to the west were dry.

The latest and successful effort to find the Alborz secret was Alborz 8, spudded 1½ miles southeast of No. 5 and well to the south of a major north thrust that the previous wells had encountered on the structure.

It was a typical Alborz well and encountered all the troubles of those that were drilled before. The salt anhydrite and plastic red saline marls found in all the Alborz wells caused stuck pipe, twistoffs, and fishing jobs.

The new producer was drilled to its total depth of 11,525 ft. by early June. Casing was set at 10,697 ft. and testing of various intervals was begun.

The first sections tested produced only salt water, but further up the hole the salt water flow was cut by oil. When IOC moved further up the hole it found the prolific pay.

NIOC is already laying plans for a natural-gas pipeline to Tehran from Sarajeh, less than 10 miles to the southeast of Alborz. In two wells already completed at Sarajeh the company has established a prolific gas-condensate field. Two more Sarajeh wells are now being tested.

Venezuelan Activity Is Still Slipping

THE DISAPPEARANCE of oil scouts is another sign that Venezuela is just not the same place anymore.

Less than 2 years ago, before the government sharply raised income taxes, every company had one or more men to keep tabs on operations of competitors. Scouts had to find out where Mobil was going to drill in Barinas. what Shell had bid for a concession in Lake Maracaibo, or whether Creole had bid for acreage in the Gulf of Paria.

Today no one gives a hoot.

Many companies discontinued all scouting months ago. Others have given scouts additional duties. Some scouts now do their only scouting at the monthly scout luncheon in Caracas.

One former scout has been reassigned to Argentina. Another is being transferred to a public relations job in Toronto. Still another scout has been shifted to Texas where he is a technical assistant.

Most of the scouts remaining in Venezuela are being assigned to part or full-time geological work. But one has been assigned to industrial security and another to an economics department.

The disappearance of scouts is in line with a further lag in drilling activity. There were only 24 rigs on wildcats at the beginning of July compared with 34 at the end of 1959. Field rigs dropped from 21 to 16; workover and service rigs dropped from 44 to 36.

More cuts are probably on the way. Shell plans to cut back to four rigs this year and to start 1961 with no more than three rigs. The company now has eight outfits drilling—four each on exploration and field work.

Relinquish concessions . . . Companies continue to drop unpromising acreage without hesitation. Among the latest are border concessions held by Phillips and San Jacinto in the states of Tachira and Zulia.

Phillips gave up two concessions and San Jacinto one, covering a total of 30,000 hectares, or about 74,000 acres. The companies paid $45 per hectare for the rights. The only remaining border concession granted during the 1956-57 awards is held by King-Mill and Sun which have parcelled their acreage.

Soviets Say "Nyet" to Oil-Dumping Charges

- **Even though exports are soaring, the Russians claim the total isn't big enough to flood any markets.**

THE SOVIETS, in the wake of a 39.8% increase in exports last year, have rejected charges that they are dumping oil in western markets for political purposes.

Last year 25,370,000 metric tons, or about 507,000 bbl. daily of crude and products were shipped abroad. Free-world countries took 14,563,700 tons, about 292,000 bbl. daily. Most of this oil moved at discounts of 10% to 25% off world prices, often payable in barter or the currency of importing countries.

Russia's Ekonomicheskaya Gazeta (Economic Gazette) says the country is selling its oil in accordance with government trade agreements, and the Soviet share of oil deliveries is not large enough to flood or disrupt the market. It claims that good trade deals are responsible for the rising sale of its crude and products in capitalistic countries, especially western Europe.

More than 10 million tons, or 200,000 bbl. daily, of crude and products moved from the Black Sea to western Europe last year. The share of Soviet deliveries to western European countries doubled between 1956-59 to reach 6.6%.

Of the 292,000 bbl. daily exports to 30 non-communist countries, 131,000 bbl. daily was in crude, and 161,000 bbl. daily in products. The biggest customer for crude was Italy, which took 47,200 bbl. daily. United Arab Republic bought 19,400 bbl. daily, and Finland, 18,000 bbl. daily.

Sweden was the biggest products buyer, taking 29,000 bbl. daily. Finland took 19,100 bbl. daily; U.A.R., 18,600 bbl. daily; West Germany, 16,500 bbl. daily; and Italy, 13,500 bbl. daily.

Among the countries taking Russian oil for the first time were Brazil, Ghana, Guinea, Lebanon, and Tunisia. Japan and Cuba started to take Soviet oil this year.

Deals have catches . . . There are indications that Russian discounts in the long run may not be as attractive as they appear. Oil is usually one item in a package trade agreement that includes a promise of shipments of machinery or complete factories by the Russians. Delivery of the equipment comes later and frequently at inflated prices.

At the same time, materials traded for oil frequently wind up in a third country in direct competition with the country of origin.

The Gazeta says more capitalist countries "are abandoning the view that Russian oil exports are a weapon of Red aggression." It also claims a survey of western European business circles shows Russia is not engaged in dumping.

Iraq Plans New Refinery and Offshore Leases

SOUTHERN IRAQ was in the spotlight on three fronts last week.

The government's General Board of Oil Affairs disclosed plans for a 40,000-bbl. refinery at Basra to supply products to the country's southern provinces. The $56-million plant will be built within 5 years. It will take supplies from Zubair and Rumaila fields operated by Basrah Petroleum Co., an affiliate of Iraq Petroleum Co.

In another development, Premier Abdul Karim Kassim authorized the Ministry of Oil to invite international bids for exploration in Iraq's offshore waters in the Persian Gulf. The ministry expects to invite tenders within a matter of days.

IPC held the Persian Gulf rights until it relinquished them voluntarily a short time after Premier Kassim came into power 2 years ago. Any new drilling rights will raise the ticklish question of the undefined offshore boundary between Iraq and Kuwait.

The third front . . . The government backed down on a new tanker-loading fee at Fao that threatened to disrupt crude production in the country's southern fields.

A test-case tanker loaded at Fao and the local port authority made no attempt to levy a charge of about 10 cents per barrel, which would be more than 10 times the former fee.

After the new charge was announced several tankers en route to Fao were diverted to other terminals. The Fao tank farm filled to capacity when no ships called for several days and output at Rumaila had to be reduced. Normal production of about 240,000 bbl. daily from Rumaila and Zubair slipped about 70,000 bbl. daily in July.

The test shipment, temporarily at least, avoided a possible major dispute between IPC and the government. The fee would have meant an additional tab of about $9-million-a-year for Basrah Petroleum, owner of the loading facilities. If the charge were passed along in the form of higher prices, Fao crude would not be competitive with other Persian Gulf crudes.

First Libyan Crude Line Let

. . . Esso hopes to start exporting Zelten crude by the first half of 1962 from Mediterranean terminal.

THE CONSTRUCTION contract for a 100-mile 30-in. pipeline outlet from Esso Libya's Zelten oil field has been awarded to Bechtel Corp. of San Francisco.

Bechtel expects to start work on the $16-million project near the end of this year, and complete it about 6 months after construction starts.

Robert A. Eeds, president of Esso Libya said much additional work will have to be done before the system can go into operation. This includes additional development drilling in Zelten field and construction of terminal facilities at Marsa el Brega on the Gulf of Sirte.

The company hopes to start exporting Libyan crude the first half of 1962.

The line will be buried for its entire length. At one point it will lie about 100 ft. below sea level. No pumping stations will be built initially. The field is well above sea level and the combination of gravity flow, large diameter pipe, and the location of the tank farm at Marsa el Brega will enable delivery of the field's full production to tankers berthing offshore without pumping.

Bechtel's contract includes the construction of a stabilized road along the pipeline right-of-way.

Esso has two rigs operating in the Zelten area. A rig used on Zelten 7 is now drilling ahead on Zelten 9. No. 7, a 13-mile stepout to the southeast, is a dry hole being used as a water observation well. A second rig is drilling No. 10, after a move from No. 8, completed as a producer between Nos. 1 and 2.

Another Jersey Standard subsidiary, Esso Sirte, will participate in a crude pipeline 80 miles to the west. This 86-mile 30-in. system will be built by Oasis Oil Co. from the Dahra area. Esso is earning 51% interest in the nearby Mabruk area from Libyan American Oil. Crude from Mabruk will flow into the trunk line from Dahra via a 36-mile 20-in. feeder (OGJ, Aug. 1, p. 103).

El Salvador Refinery Set

ROYAL DUTCH-SHELL, lured by a fast-expanding oil market in Central America, will build a new 10,000-bbl. refinery in the little Pacific Coast country of El Salvador.

The new refinery will cost $9,800,000 and will be equipped with a catalytic reformer and hydrogenation unit. The new plant will be built at Acajutla, about 50 miles from San Salvador.

In conjunction with the processing plant, the Royal Dutch-Shell Group plans to establish marketing companies in El Salvador, Honduras, Nicaragua, and Costa Rica. The 30,000-bbl.-daily inland consumption of this region is expanding at the rate of about 10% a year.

French Government Will Have Bigger Role in Marketing

A NEW FRENCH company will give the government's Bureau de Recherches de Petrole (BRP) a bigger behind-the-scenes voice in local marketing.

The company, Groupement des Exploitants Petroliers, will have one-third interest in another new company that in turn will have 60% interest in Caltex refining, marketing and transportation facilities in France.

BRP has a substantial minority interest in all four companies forming Groupement des Exploitants. It has 40% interest in both SPAEF and SNPA and 15% interest in both CEP and PREPA. All four firms carry on exploration and producing operations in France or Africa.

Groupement des Exploitants will have one-third interest in Union Generale des Petroles (UGP), the company being formed to take over the Caltex facilities. Caltex will hold 40% interest in a new joint company to be formed with UGP. Marketing will be carried on under the Caltex trademark for the time being.

BRP already has a voice in UGP through a 40% interest in SN REPAL, half-owner of Hassi Messaoud oil field. SN REPAL has a third interest in UGP. The remaining third is held by RAP, a government-owned holding company.

RAP has interests in several operating companies, including CREPS, which is developing major production in the Edjele area of Algeria.

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Israel's Zohar Gas Field Looks Bigger

A WILDCAT which found gas 2 miles northeast of Israel's Zohar gas field promises big consumers additional reserves, but it didn't stop their squabble over pipelines from the area.

Kidod 1 encountered gas pay in the same horizon as Zohar and may be a 2-mile extension of the field. The well was bottomed at 1,400 meters, or about 4,580 ft. Naphtha Israel has title to the concession and is operator in a joint test with Israel Negev Petroleum.

Pipe is on order for an 18-mile 6-in. line from Zohar to a potash plant at Sodom, on the Dead Sea, and a 75-mile 16-in. line to a power plant at Ashdod Yam on the Mediterranean Coast (OGJ, Mar. 28, p. 114). At least one of the systems is expected to be in operation by 1961.

Both future customers are insisting on ownership of their respective supply lines. They want to buy gas at the wellhead and avoid transmission costs.

The Government wants to set up an independent pipeline company to own and operate the lines. This firm would be financed in part by the country's three leading marketers. Gas would be sold at the place of delivery at rates approved by the petroleum commissioner.

Gulf Italia Drops Suit Against Paper

GULF ITALIA has withdrawn legal action against L'Unita, a communist-slanted newspaper published in Italy, following the paper's complete retraction of a 1959 story charging Gulf with "theft."

The alleged "theft" referred to a four billion lira profit, equal to about $6.4 million at the official exchange rate, mentioned in the Gulf Oil Corp. subsidiary's 1957 annual report. The profit was a "theft," charged the newspaper, because Gulf had discovered Ragusa oil field in 1953 using studies and exploration data taken from Italian government offices.

Gulf Italia filed a libel suit against the editor of L'Unita and the article writer, and produced two suitcases filled with documentary evidence of exploratory work by Gulf. Nicolo Pignatelli Aragona, Gulf Italia vice president, said the documents proved without a doubt the L'Unita statement was groundless. The Ragusa find was based solely on 4 years of study and exploration work carried out by Gulf.

L'Unita published a statement to this effect and made a complete retraction of the charges.

Peruvian Refinery Planned

A NEW 12,000-bbl. refinery is to be built near Lima, Peru, by interests in that country and the U. S.

Refineria Conchan California, S.A., has been organized to build the refinery. Its president is Dr. Mariano Prado, a nephew of Dr. Manuel Prado, President of Peru.

The cost of the refinery is estimated at $15 million. Private capital is to provide 65% of the cost. One reported investor is the Bank of America. Standard Oil Co. of California has a 35% interest in the new company.

The Prado family has varied interests in the country, including real estate, and cement, fertilizer and textile plants.

FOREIGN BRIEFS . . .

A record net oil sand for a Venezuelan well is believed to have been encountered by Sun Oil's SVS-41 outpost well in the Lama area of Lake Maracaibo. The well has logged 1,470 ft. of net oil sand in the B and C sections of Eocene and was believed to still be in oil sand at 14,300 ft. Projected total depth is 15,100 ft.

Oronite Chemical Co. and Nippon Petrochemicals Ltd., Japan, will build a detergent polymer and alkylate plant at Kawasaki. The new plant, capable of meeting all of Japan's detergent requirements, will be operated by a newly formed company, Nippon Petroleum Detergent Co. Ltd., 45% owned by Oronite. Completion is planned by late 1961.

A new urea plant, with a capacity of 25,000 tons per year, has been put into operation by the West German firm Union Rheinische Braunkohlen Kraftstoff AG. The facilities are at Wesseling, near Cologne.

An expansion of catalytic cracking and related facilities at SACOR's 24,000-bbl. refinery near Lisbon, Portugal, is scheduled for completion in early 1961. Purpose of the expansion is to increase the output of propane and butane needed to supplement manufactured gas for Lisbon. The engineering and construction contract has been awarded to Hydrocarbon Research.

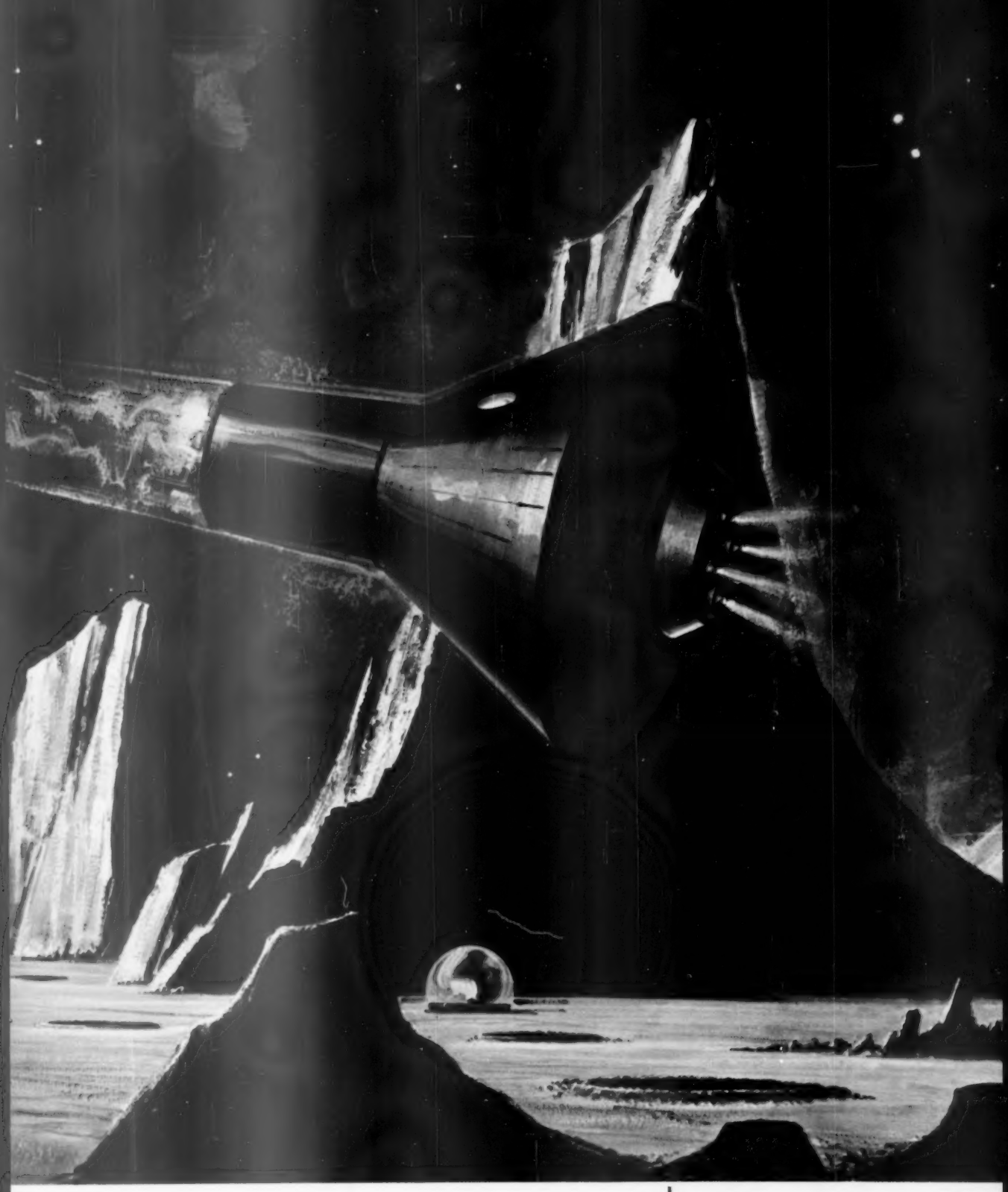
European Convention of Chemical Engineering and the ACHEMA, chemical engineering exhibition-congress, will be held June 9-17, 1961, in Frankfurt am Main, Germany. A number of European technical groups are cooperating in the convention, which drew almost 100,000 people from 56 countries to Frankfurt in 1958.

Austrian shipments of crude to Russian satellites will again be revised in Austria's favor. A new pact now being worked out will cut reparation shipments from 20,000 bbl. to 10,000 bbl. daily. Net exports will be the same because Russia will stop sending 10,000 bbl. daily back into Austria. But Austria will gain because of a wide difference in quality between its crude and high-sulfur Russian oil. Shipments will now end in 1964 instead of 1965.

An initial price posting for Gach Saran crude has been set by CFP at $1.67 per bbl. for 31 to 31.9°-gravity f.o.b. Kharg Island, a new Iranian terminal on the Persian Gulf. There is a 2-cent differential for each degree change in gravity. The price matches the posting of Kuwait crude of similar gravity at Mina al Ahmadi.

A Czechoslovakian firm, Technoexport, will carry out two refinery expansion programs in Egypt planned under the United Arab Republic's new 5-year program. The projects include the addition of 20,000 bbl. capacity at a 6,200-bbl. refinery at Alexandria and the construction of 20,000 bbl. capacity at a plant at Suez.

White Eagle International, Inc., has signed a 20 year agreement to initiate secondary recovery in the Argentine oil properties of Astra Cia. Argentina de Petroleo S.A. The contract covers 14,905 acres in the Comodoro Rivadavia area which has produced since 1917. White Eagle has completed its engineering study and is ready to begin an experimental pilot flood.



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How to design glycol dehydrators

. . . for 100° F.-plus dew-point depression

BY CHARLES R. PERRY
Sivalls Tanks, Inc.

UNTIL about 2 years ago, glycol dehydration was never seriously considered when dew-point depressions in excess of 75° were required except in a few plant units where vacuum regeneration was used. However, glycol dehydration units are now being built by several manufacturers for dew-point depressions greater than 100° F. This has caused gas-process men to reconsider the type of dehydration to be used where high-dew-point depressions are required.

A number of developments have contributed to this breakthrough of the old 75° F. depression limit for glycol dehydration. Most important of these is the fact that glycol dehydration equipment is being designed far more completely and thoroughly than ever before. Gone are the days of rule-of-thumb design of glycol dehydration equipment such as "four tray contractors and 98% glycol"; instead, dry glycol concentrations are being accurately calculated and increased. Required absorber transfer units are being carefully determined.

Another important contribution to high-dew-point depressions is the development of the glycol-powered pump, which provides a small quantity of accurately measured gas proportioned to the glycol circulation rate which may be used for gas stripping of the glycol.

Presented at gas conditioning conference, University of Oklahoma, Norman.

Process-design data for triethylene glycol dehydration of natural gas for dew-point depressions in the 60°-115° F. range have been calculated and correlated and are presented here. Although these calculations represent theoretical performances, they have correlated very well with field test data. They were calculated from published[1] equilibrium and vapor-pressure data.

How it works. Fig. 1 shows a typical glycol-dehydration flowsheet, in which lean glycol is pumped into the top of an absorber column countercurrent to the gas stream to be dehydrated. The rich glycol stream leaves the bottom of the absorber, passes through the power side of a glycol-powered pump (or level controller and motor valve), and into a flash chamber, or gas-glycol separator. Here, entrained and dissolved gas is removed from the glycol; (this gas may then be used for the stripping of the glycol).

The rich glycol passes through a heat exchanger, (countercurrent to the hot, lean glycol), through a filter, and into the stripping still. Water vapor and stripping gas (if any) are removed from the top of the stripping still through a partial reflux condenser. Lean glycol leaves the reboiler, passes through the heat exchanger countercurrent to the rich glycol, and through the pump back into the absorber column.

In a typical dehydration design problem, the process engineer will be given the inlet-gas conditions (pressure, temperature, and degree of saturation), and the required dryness of the outlet gas. He must then design the most economical plant which will provide the desired performance.

The first step in a design problem should be to assume a glycol circulation rate and estimate the dry glycol concentration. Next, the absorber column should be sized. Once these two steps have been completed, the remainder of the process design is routine, such as heat exchange, line sizing, filter sizing, and so forth.

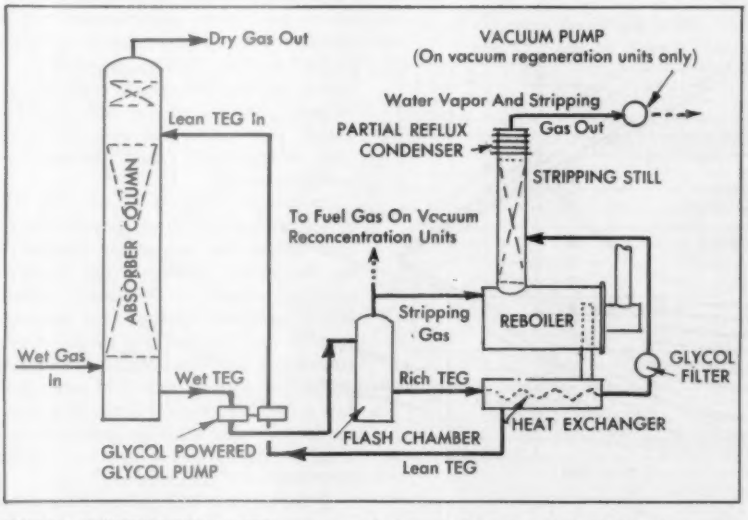
It is extremely important that a complete material and heat balance be made around each piece of equipment. Reboilers, stripping columns, and heat exchangers are frequently undersized by design engineers using rule-of-thumb design data. Also, accurate material balances are absolutely essential in the use of the data presented below.

Regeneration System

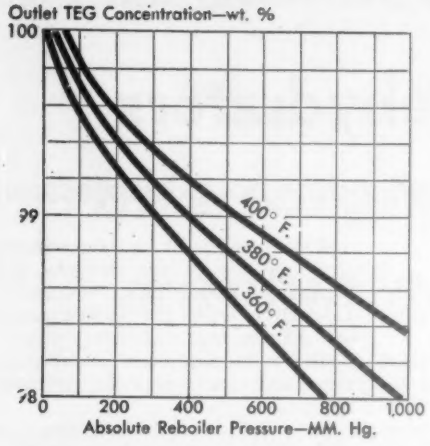
Design of the glycol reconcentration still should be done in a conventional manner to determine the number of theoretical trays required to provide the desired outlet dry glycol concentration. However, a number of problems arise in the design of the reconcentration still: accurate equilibrium data for water-triethylene glycol systems at higher temperatures are not readily available; also, the glycol temperature should never exceed 400° F. to prevent excessive decomposition.

Since 100% triethylene glycol has a vapor pressure of only 65 mm. mercury at this temperature, it is necessary that the reboiler operating pressure be reduced to increase dry glycol concentration above that shown on boiling point curves. This may be done by gas stripping or vacuum regeneration.

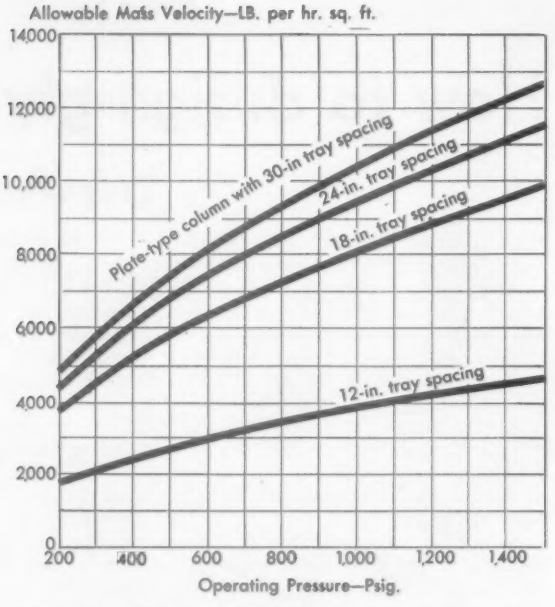
Dry glycol concentrations may be accurately predicted from vapor-pressure curves for units using vacuum



GLYCOL DEHYDRATION UNITS are now being designed and built for dew-point depressions in excess of 100° F. Fig. 1.



CONCENTRATION of outlet triethylene glycol in a vacuum regeneration system can be estimated from these curves. Fig. 2.



ABSORBER COLUMN CAPACITIES can be based on these curves. Fig. 4.

regeneration. However, design of a still using gas stripping is quite complex when reflux rates and theoretical trays are considered, since the partial pressure of the stripping gas varies through the column due to changes in water-vapor concentration. Data presented below may be used to predict dry-glycol concentrations when gas stripping is used. These values may be increased somewhat by increasing reflux ratios and the number of theoretical trays in the stripping section of the column.

Stripping-still column cross-sectional areas can be determined from flood point correlations as presented in published literature[2] from vapor and liquid loadings and the type of packing used. Most process engineers design glycol stripping stills to operate at between 60 and 80% of flood point of the column.

Direct-fired reboilers for triethylene glycol normally are designed with heat fluxes of 8,000 to 10,000 B.t.u./hr.-sq. ft. Steam-heated reboilers and the heat exchangers should be designed in accordance with the Standard of Tubular Exchanger Manufacturers Association.

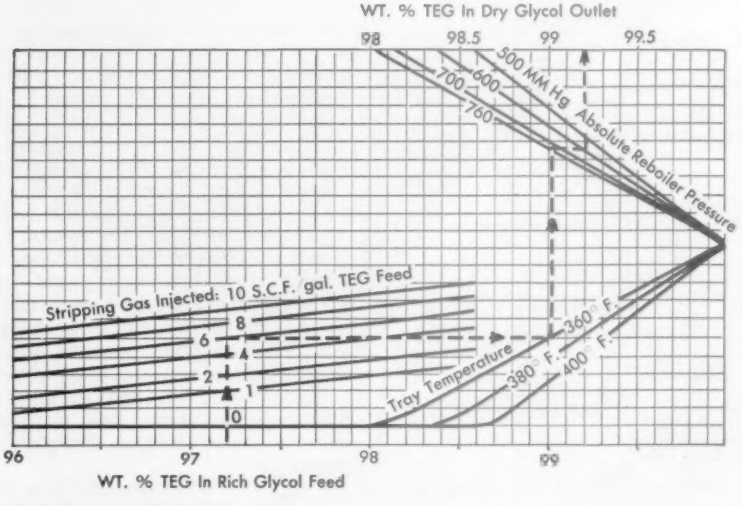
Vacuum regeneration. Reconcentration of glycol under vacuum has been successfully used in plants for some years. Vacuum is usually maintained by steam ejectors or motor-driven vacuum pumps. This type of reconcentration should be employed wherever possible where high concentrations of glycol are required. With the price of gas increasing each year, gas stripping of glycol normally cannot be economically used in the larger units.

The curves in Fig. 2 may be used to predict outlet triethylene glycol concentrations for vacuum reconcentration systems. When using vacuum regeneration, the stripping still should be designed to provide sufficient reflux and rectification to hold glycol losses within tolerable limits.

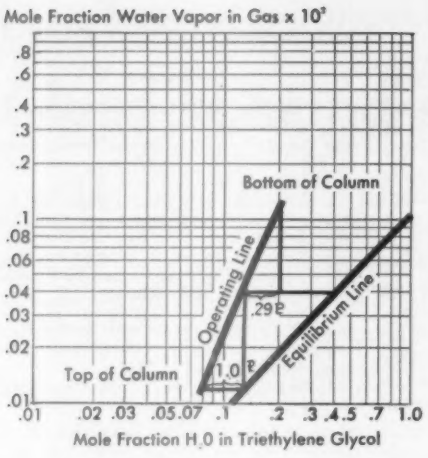
Gas-stripping regeneration. In order to allow the process engineer to estimate dry triethylene glycol concentrations obtainable with gas stripping, a generalized correlation, based on published triethylene glycol-water vapor pressure data[1], was calculated and plotted in Fig. 3. This correlation is based on one theoretical tray in the stripping section of the still and includes parameters for stripping gas, tray temperature, and absolute reboiler pressure.

In using this graph, start with the concentration of "Rich Glycol Feed" and follow the procedure illustrated by the dotted arrows. If the absolute reboiler pressure is 760 mm., follow a line vertically through this intersection to the "Outlet Dry Glycol Concentration"; if the absolute reboiler pressure is other than 760 mm., follow a line horizontally from this intersection to the reboiler pressure and then vertically again to the "Outlet Dry Glycol Concentration."

If a stripping still contains a whole-number multiple of theoretical trays, this graph may be used for a tray to



TRIETHYLENE GLYCOL CONCENTRATIONS possible with gas stripping are shown on this graph. Fig. 3.



MODIFIED McCabe-Thiele diagram showing a graphical calculation of required theoretical transfer units. Fig. 5.

tray calculation, in which the "Outlet Dry Glycol Concentration" from each tray represents the "Rich Glycol Feed" to the tray below it. The stripping gas parameter lines are drawn for standard cubic feet of gas per gallon of glycol, and therefore, would remain the same throughout the column. Average temperature of each tray must be known to make this tray-to-tray calculation.

Absorber Column

The absorber column should be designed according to standard process-design procedures. The required cross-sectional area may be calculated with the Brown and Sauders equation[3] for tray-type columns:

$$G = C\left(\frac{(P_V)}{(P_L - P_V)}\right)^{1/2}$$

where:

G = mass velocity of vapor through column, lb./hr.-sq. ft.

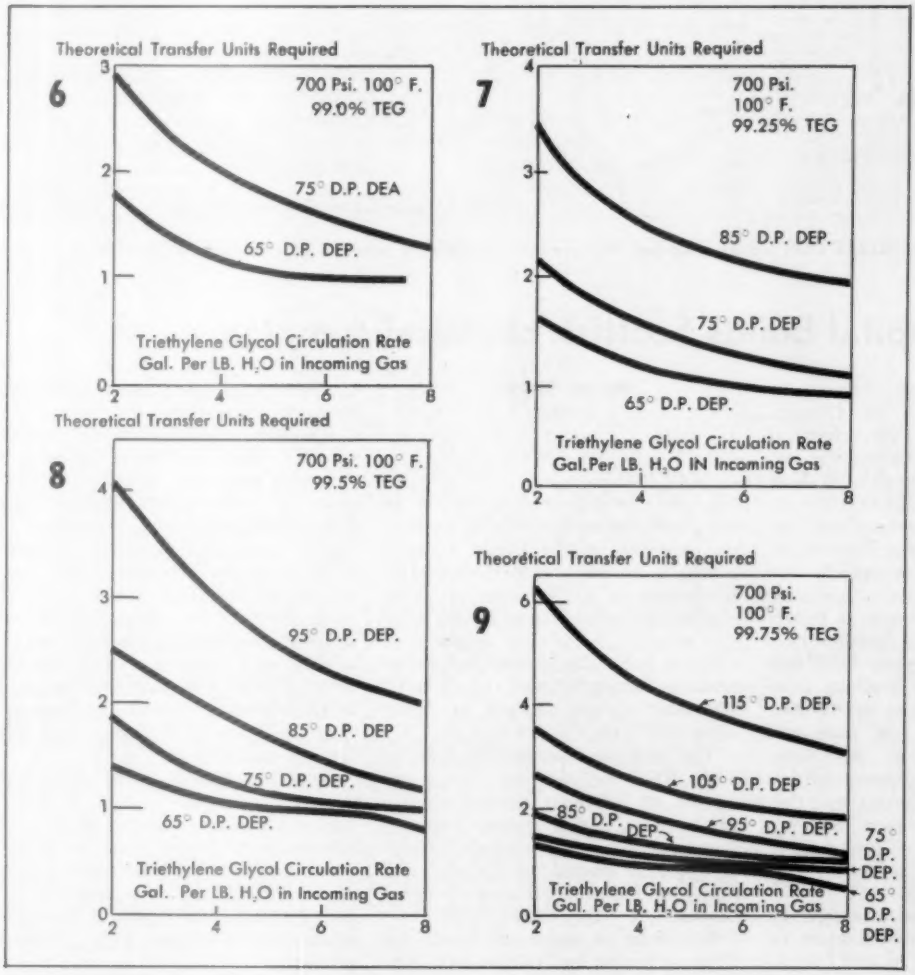
C = a constant depending on surface tension.

P_V and P_L = densities of vapor and liquid, respectively, lb./cu. ft.

Capacities of tray-type columns with various tray spacings are plotted in Fig. 4. Capacity of the glycol mist extractor in column should be checked against these capacities to be certain that the mist extractor area is sufficient. For most high-efficiency wire-mesh mist extractors, the capacity of the mist extractor will exceed the column capacity. Slot area, chimney area, and downcomer size should be calculated by conventional tray-design methods.

Cross-sectional areas required for packed columns may be determined from generalized[2] or specific[4] published flood-point correlations. Columns should be designed 60% to 80% of flood-point rates, depending on the reliability of the flood-point data used.

Theoretical transfer units required may be calculated using a modified McCabe-Thiele diagram,[5] in which the mole fraction of water in the glycol is plotted versus the mole fraction of water in the gas at equilibrium on a log-log graph. Fig. 5



THEORETICAL transfer units for triethylene glycol at varying concentrations and circulation rates are shown in these figures. Pressure variation between 500 and 1,000 psi. has no effect on these values, but temperature changes do have a slight effect. Figs. 6-9.

presents a typical graphical calculation of the number of transfer units required for a specific dehydration problem.

Using this method, the required theoretical transfer units for various circulation rates of dry triethylene glycol at different concentrations were calculated and plotted in Figs. 6 through 9. These correlations are based on 700 psi. and 100° F. Variation of the pressure between 500 and 1,000 psi. has no effect on these values; however, temperature variations do have a slight effect on the theoretical trays required. These values should be increased approximately 3% for each 10° F. decrease in temperature and decreased 3% for each 10° F. rise.

Tray efficiencies for triethylene glycol-gas systems range from 20 to 40%, depending on tray design, loading, etc.; however, an efficiency of from 25 to 30% is recommended for average design work in converting theoretical to actual trays. For packed columns, very few HTU (Height of a Transfer Unit) data are available specifically for gas-glycol systems. In the absence of specific data, one may use a generalized correlation, if available, to determine the HTU of the packing material under consideration; for safe design purposes, one should use a 100% safety factor with theoretical HTU value obtained from a generalized correlation.

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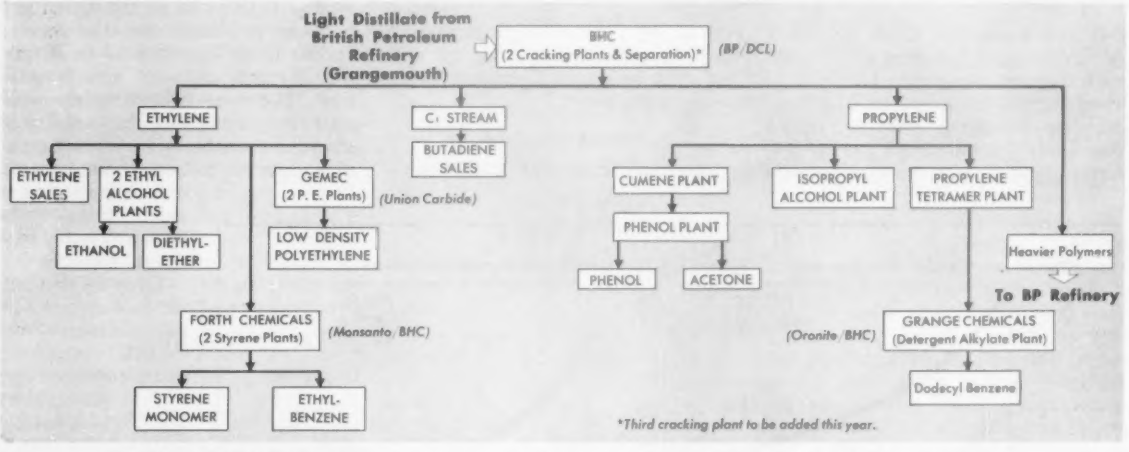


REFINERY DISTILLATE ends up as a variety of chemical products in Scotland's petrochemical center.

American capital builds Scottish chemical complex

BY M. SWISS
London

AROUND the Scottish refinery of British Petroleum Co. at Grangemouth, a cluster of petrochemical plants has grown up during the last 12 years. The capital invested in these plants, more than $225,000,000 at present, is largely American with the companies involved being Union Carbide, Monsanto and Oronite.

British Hydrocarbon Chemicals, Ltd., (BHC) a joint venture of British Petroleum Co. (BP) and Distillers Co., Ltd., (DCL), makes up the basic unit of this complex. Light distillate from BP's refinery is cracked in the two BHC 30,000-ton per year units and separated into ethylene, propylene, butylene, and heavier polymerized hydrocarbons. A third cracking unit that is scheduled for completion this year will more than double the existing 60,000 - ton - annually capacity (OGJ, Apr. 11, 1960, p. 103).

Most of the ethylene produced by BHC is used for the manufacture of pure industrial alcohol in BHC facilities, and low-density polyethylene in two plants owned by GEMEC (a British company of the Union Carbide group). Later this year BHC will begin production of 11,000 tons per year high-density polyethylene by the Phillips process. A smaller quantity of ethylene goes into styrene and ethylbenzene, manufactured by Forth Chemicals (jointly owned by Monsanto and BHC).

The propylene production goes to other BHC facilities for the manufacture of isopropyl alcohol, phenol and acetone, and propylene tetramer. The tetramer goes to Grange Chemicals (jointly owned by Oronite and BHC) for the production of detergent alkylate.

Butadiene is separated from the butylene stream and sold as such, and the heavier polymer stream is returned to the BP refinery.

The BHC cumene-phenol plant uses the DCL-Hercules Powder Co. process in which propylene is added to benzene by Friedel-Craft reaction, the $CH_3—CH(C_6H_5)—CH_3$ is oxidized in air at a slightly elevated temperature in alkaline conditions to form $CH_3—COOH(C_6H_5)—CH_3$ which is then purified by reduction of alkalinity and eventually decomposed by a weak acid solution to CH_3COCH_3 and C_6H_5OH. This plant was designed and constructed through the joint efforts of Stone & Webster, Scientific Design, and DCL.

The ethanol is made by direct hydration of ethylene at high temperature and pressure, yielding 92% ethyl alcohol with diethyl ether as a by-product. The isopropyl alcohol is produced through the formation of isopropylsulfuric acid which is later hydrolized to yield an 87% aqueous product.

Utah's Aneth may halt

Close-spacing arguments

• Overwhelming volume of testimony convinced Utah commissioners that 80-acre spacing was close enough. Attitude of many close spacers may be changed as a result. Here are some of the arguments that were presented at the Aneth hearings.

THE RECENT ORDER of the Utah Oil and Gas Commission establishing 80-acre spacing for the Greater Aneth Area is one of the most significant conservation events in recent years.

The full import of the decision is lost, however, if it is considered only in the light of the Aneth area itself.

The factual data obtained represent a unique case history of the ability of an 80-acre spacing pattern to deplete an oil reservoir efficiently even under seemingly adverse reservoir conditions. A study of the Aneth data, therefore, should be of much assistance to the industry in establishing the proper well density of other reservoirs, particularly those where close spacing might be considered necessary for efficient depletion.

Costly study. The Aneth decision was based on evidence and technical arguments presented during nearly 50 days of testimony before the commission over a 2½-year period. It is probable that the securing of the evidence and the presentation of the arguments in this case represented an expenditure of around $2,000,000. Operators spared no expense and used their full technical resources in obtaining and evaluating a volume of data which probably exceeded that available on any other single reservoir prior to the issuance of a spacing order.

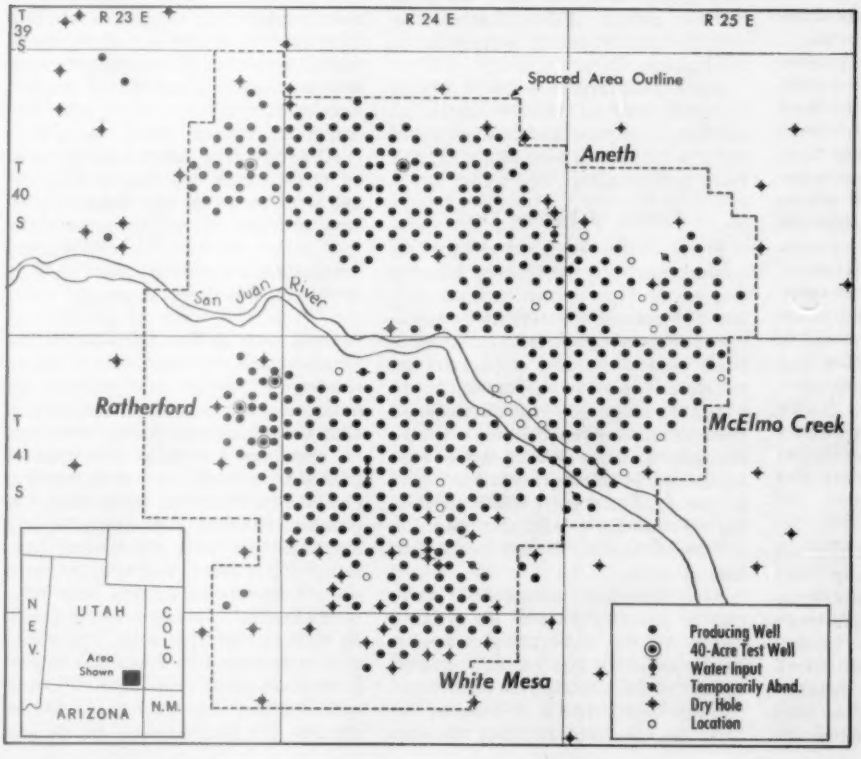
Information was available from over 400 wells, where often only one or two wells have been drilled when spacing is considered. Over 55 million barrels of oil had been produced prior to the final hearing before the commission, and the effect of this production on the reservoir pressure was determined by periodic field-wide pressure surveys. A large number of special production and pressure tests were taken to measure the degree of pressure interference, not only between wells, but also between zones within the same well. The most unusual data, however, was obtained from the five 40-acre infill wells drilled and tested at a cost of $750,000 for the purpose of determining the pressure behavior of individual porous zones within the entire producing section.

Field Description

Aneth field lies in the southern part of Paradox basin, and has a currently proven productive area of approximately 50,000 acres. Although the entire area is a common source of supply, various factors made it convenient to divide the field into four major subareas, Fig. 1. These are Aneth, McElmo Creek, White Mesa, and Ratherford.

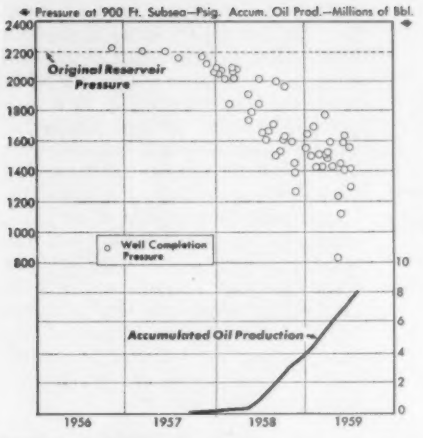
Separate 80-acre-spacing applications were originally filed for groupings of these subareas. These were later consolidated and the entire reservoir was covered by a single spacing order.

The Paradox B, or Desert Creek, zone is the principal producing hori-

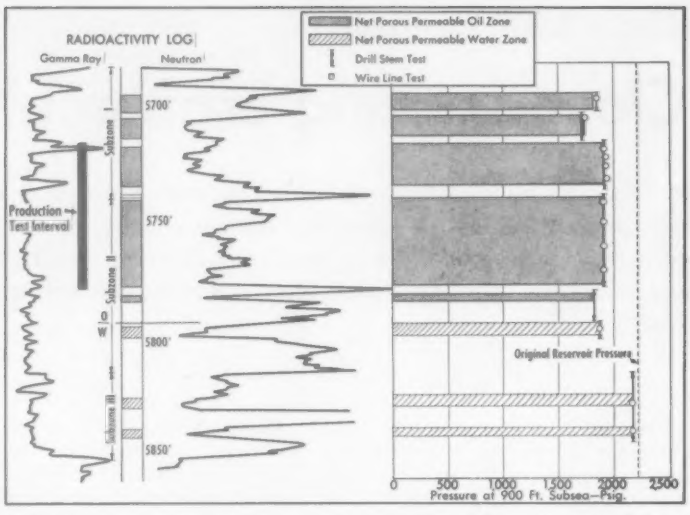


IN-FILL WELLS, drilled on 40-acre spacing for observation purposes, are shown as open circles with solid centers. Fig. 1.

Editor's Note: This article is adapted from the summary of the Aneth hearing by the chief engineer of a major oil company. It was made available to the Journal with the request the author's name and that of the company be withheld. Since we agree with the premise on which the article was written, we are pleased to comply.



SHOWN HERE are reservoir pressures at time of completion of 58 wells in the Ratherford area. Fig. 2.



SUMMARY of pressure tests in the No. 22-13 Burton well. Note that all pressures are below the original reservoir pressure in the productive zones. Fig. 3.

zon, which is a reefal type carbonate buildup of Pennsylvanian age at a subsurface depth of approximately 5,600 ft. The producing section has an average gross thickness of 170 ft., of which approximately 40 ft. is considered net pay. The reservoir is generally characterized by three porous subzones stratified by relatively dense carbonate.

The upper, or Subzone 1, consists of interbedded limestone and dolomite with a predominantly intergranular porosity development.

The middle, or Subzone 2, is largely limestone characterized by a more vugular type of porosity. It has somewhat lower porosity than Subzone 1, but has greater permeability, particularly in some individual porous streaks.

Subzone 3 is a lower porous dolomitic limestone which is not considered commercially productive at this time. In common with other carbonate reservoirs, correlation of individual porous members within the subzone between wells is possible, but difficult, and subject to widely different interpretations.

It was this problem of heterogeneous porosity development that raised a question as to whether it would be possible to penetrate all of the separate porous zones by an 80-acre-spacing pattern, and that the drilling of 40-acre wells would be necessary to recover the substantial quantities of oil that existed in these interpreted isolated "islands" of porosity.

Low relief. Structural relief is not very pronounced, with the dip away from the crest generally averaging less than 1½°. Although water levels control the productive limits in portions of the Aneth and Ratherford areas, lack of porosity and permeability, rather than structure, has been the primary factor in defining the productive limits. The porosity is highly variable and averages approximately 10%. Permeability, likewise, is subject to wide variations, ranging in the vugular zones up to 2,500 md., but averaging 20 md. over the entire net pay section.

Connate-water saturations reportedly average 21%. The 42°-API-gravity oil has a surface viscosity of 1.8 cp. The original pressure was 2,200 psi. and the bubble point was 1,730 psi., with minor variations being observed between certain of the subareas. The predominant producing mechanism is solution-gas drive.

Since discovery in 1956 to March 1, 1960, over 61 million barrels of oil have been produced, while current daily production is around 90,000 bbl. from approximately 500 wells.

Nature of Factual Data

Much of the evidence obtained in conjunction with the spacing question was of the type normally considered, i.e., (1) comparisons of well-completion pressures versus time or accumulated production, and (2) special interference tests of offsetting wells. Fig. 2 is an example of the completion pressure data from 58 wells in the Ratherford area. While wells were completed in this portion of the pool in late 1956 and early 1957, substantial oil was not produced until completion of pipeline outlets in the first half of 1958.

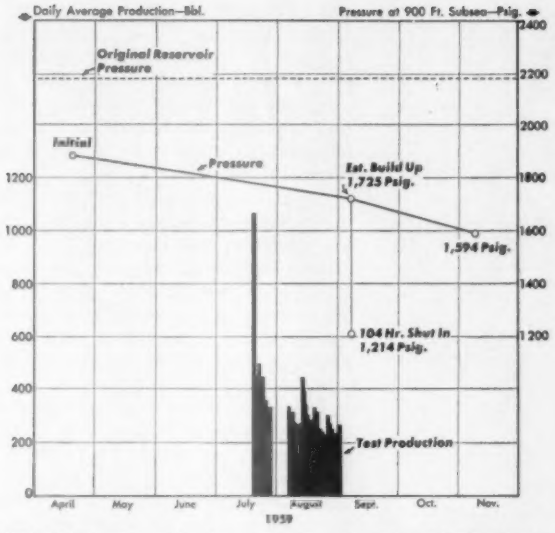
The consistent reduction in completion pressure from the original shown by the wells completed after such production had begun is characteristic of the trends observed throughout the field. And it is definite evidence of oil drainage from the area of the newly drilled wells by production from the earlier drilled wells. Since the later wells included stepout locations in addition to those drilled on the normal 80-acre pattern, the drainage of oil over areas of 160 acres and larger is also demonstrated.

Interference tests. Effectiveness of 80-acre spacing in draining the reservoir was also supported by a wide variety of interference tests conducted throughout the field in which production of individual wells was reflected by reductions in pressure of offsetting wells. A number of special tests were also conducted wherein the vertical interference between individual porous zones was shown.

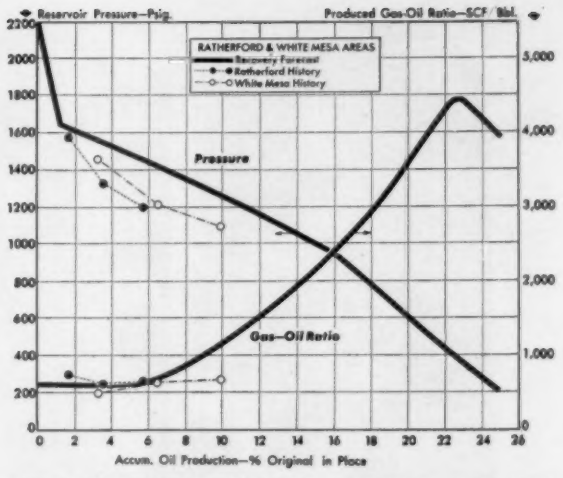
Although these zones are separated by dense limestone, natural fractures and styolites within this dense interval were observed in various parts of the field which aided in the vertical communication afforded by interfingering of the individual porous layers.

Infill wells drilled. Because of the limitations of the interference data to resolve the question as to whether the entire reservoir was in communication with the 80-acre producing wells and in order to ascertain if undrained islands of porosity did exist between the 80-acre locations, permission was obtained from the commission to drill five infill test wells on 40-acre locations. Fig. 1 shows that three of these wells were drilled on the west edge of Ratherford, and two were in Aneth. In each of the five wells, the entire pay section was first cored and logged.

A painstaking and carefully controlled effort was then made to determine the pressures in the various



SUMMARY of production tests in the No. 22-13 Burton well. Note pressure decline from September to October 1959 even after well was shut in. Fig. 4.



HEAVY LINES show the predicted performance of the Ratherford and White Mesa areas assuming 40-acre spacing. Also shown is the actual performance of the areas over a 1-year period from November 1958 to November 1959. Fig. 5.

layers within the reservoir by employing both conventional drill-stem test and wire-line test tools. A total of 48 wire-line and 42 drill-stem pressure tests were successfully run in the five wells. Short production tests were made at two of the wells, after which they were shut in. Three wells were never produced.

Pressures low. The measured pressures were appreciably below the original value in all of the productive porous zones in the five wells with the exception of one 3-ft. zone in one well which represented approximately 1% of the total pay. The fact that these data reflected pressure reductions in all producing zones of significance constituted proof of the interconnection and drainage of the entire reservoir by the existing spacing pattern.

The extensive test information from these five wells constitutes a definite contribution to the knowledge of the industry on the spacing question and merits serious study, particularly by those concerned with the possible detrimental effect of porosity and permeability varitions upon communication within carbonate reservoirs.

Pressure and production tests conducted at the 22-13 Burton well were of particular interest. Twenty-one zonal pressure measurements were made in April and May 1959 immediately after the well was drilled. These are summarized in Fig. 3. With the exception of the measurements in Subzone 3, which is not commercially productive, all of the results reflected substantial reduction below the original pressure, with the 1,900 psi. observed in the main portion of the pay representing a pressure reduction of 270 psi.

Approximately 11,000 bbl. of oil was produced during a short production test made of a portion of the pay in the well during July-September 1959, following which the static pressure was estimated at 1,725 psi. These tests are shown graphically in Fig. 4. Although the well was not produced after this test, the fact that the reservoir in the vicinity of the well was being drained by offsetting wells was further demonstrated by a pressure survey taken in November 1959.

The pressure was measured at this time at 1,594 psi. after a shut-in period of over 2 months. This was roughly 300 psi. below the initial pressure obtained 7 months previously and 131 psi. below the estimated static pressure at the time the well was last produced.

Sound argument. One of the more convincing demonstrations that the reservoir was not only completely interconnected but also that such interconnection was adequate for efficient drainage by 80-acre wells was the actual history of pressures and gas-oil ratios in relationship to the total cumulative recovery.

Fig. 5 is a plot of the theoretical pressure and gas-oil ratio relationships versus accumulated oil production which was predicted for efficient drainage of the reservoir on 40-acre spacing. Also plotted is the actual history for the Ratherford and White Mesa areas referred to the November 1958 and the May and November 1959 pressure surveys.

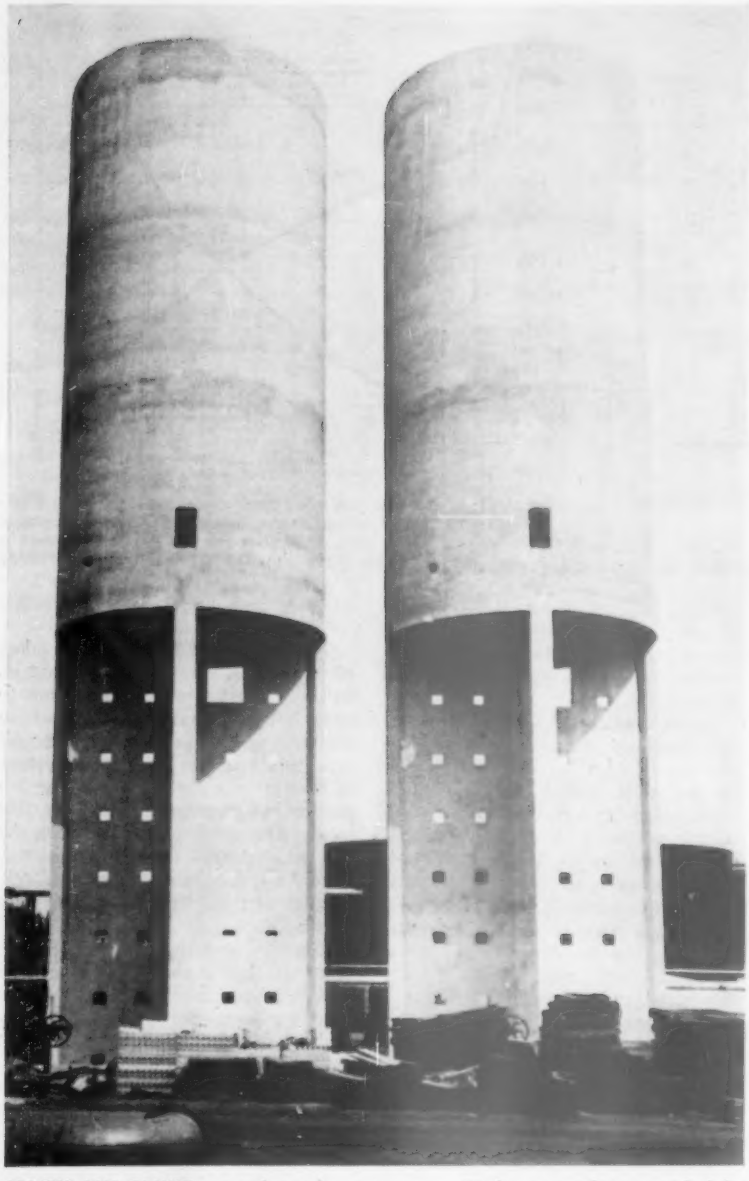
These pressure surveys were taken after some 72 to 104 hours' shut-in, which is known to be insufficient to allow a large number of the wells to stabilize. Therefore, the true reservoir pressure is higher than the average of the survey measurements. The important pressure feature, however, was the leveling of the trend between the last two surveys so that the actual history on 80-acre spacing was closely parallel to that predicted for 40-acre spacing.

The gas-oil-ratio trends were even more striking in their close conformance to the predicted values. If the reservoir were not being efficiently drained by the 80-acre pattern, the reservoir pressures would be declining at a much more rapid rate with an accompanying sharp increase in the observed gas-oil ratios.

Conclusion

One conclusion which can be drawn from the Aneth spacing case is that there is often a tendency to exaggerate the detrimental effect of reservoir variations upon drainage efficiency. The sincere effort which was made by both the proponents of 40 and 80-acre spacing at Aneth to obtain and analyze the performance of the reservoir has permitted the accumulation of data whereby the effect of these variations could be placed in the proper perspective.

Extension of the knowledge gained at Aneth to the study of proper well spacings for other producing areas could well benefit the industry far more than the $50,000,000 which would have been required to redrill Aneth field itself.



STACKS AND TOWER are independent structures. Discharge stack is provided for each fan cell. Fig. 1.

Unique cooling tower overcomes ground fog

• If you've ever tried to work in the dense fog around a cooling tower on a cold day, you know how tough it can be. Here's how one company solved this problem by building a tall discharge stack on each fan cell.

BY DONALD R. BAKER
Research Associate
Marley Co.

AT ITS East Chicago, Ind., refinery, Sinclair Refining Co. has solved the problem of cooling-tower ground fog with a tower specifically designed to overcome this handicap. While not the first approach to eliminating the fog nuisance, it promises to be the most successful one.

Ground fog is caused when moisture in the vapor discharged from the towers condenses and is pulled down to ground level by air currents. The most effective—if not the only—solution to the problem, is to extend the height of the structure to provide a high-level discharge that allows fog to diffuse into the surrounding atmosphere.

This conclusion is based on information contained in "Know Your Cooling Towers," an article by Lester M. Ferguson, of Sinclair Refining Co.'s central engineering department, which discussed in detail the theory and performance of high-discharge cooling towers. (OGJ, June 24, 1957, p. 130.)

Three towers with the side walls extended to a height of 120 ft. were built at the refinery before 1959, but all have certain drawbacks.

The oldest one is a conventional induced-draft tower. The electric motors are on the fan deck, which is enclosed by the extended walls, so that the motors, in effect, operate in the moist exhaust air stream. This environment is not good for the equipment, and makes servicing or inspection both difficult and unpleasant.

The other two high-discharge towers are of special forced-draft design which offers two advantages: Mechanical equipment is supported on firm foundations and operates in dry entering-air stream. These advantages were obtained at added cost, but the benefits are partially offset by greater icing problems during cold weather.

When a new tower was needed, Sinclair selected a unique design offering the advantages of the older towers, plus other features not possessed by any of them.

A major influence on the new design was the desirability of individual discharge stacks for each fan cell. Compared to commonly used extended side walls, individual stacks reduce the obstruction to air flow and consequently reduce downdrafts. Also, dry air passing between the stacks tends to dilute the vapor and reduce the density of fog.

Thus augmented, functional efficiency of individual stacks showed that the over-all height could be reduced from 120 ft. to 100 ft. Other potential advantages included elimination of objectionable operating conditions, reduced maintenance cost, and prolonged tower life.

Previous unsuccessful approaches

to the problem had been based on producing a practical stack that could be built to required height with anchorage and support provided by the top of the cooling-tower structure. Designers of the new tower made a radical change: Construct individual concrete stacks, then built the tower around them with stacks and tower remaining independent structures (Fig. 2).

As installed, the tower is a two-cell double-flow type, each cell being 50 ft. wide by 32 ft. long and having 36 ft. of fill height. Only minor modifications to a standard tower design were required to permit building it around the base of the concrete stacks.

Each fan stack is a reinforced-concrete cylinder 26 ft. in diameter with 6-in.-thick walls. The base of the cylinders correspond to the elevation of the fan deck and are 58 ft. 8-in. high. The 42-ft. supporting structure extends from the foundation at ground level to the height of the fan deck.

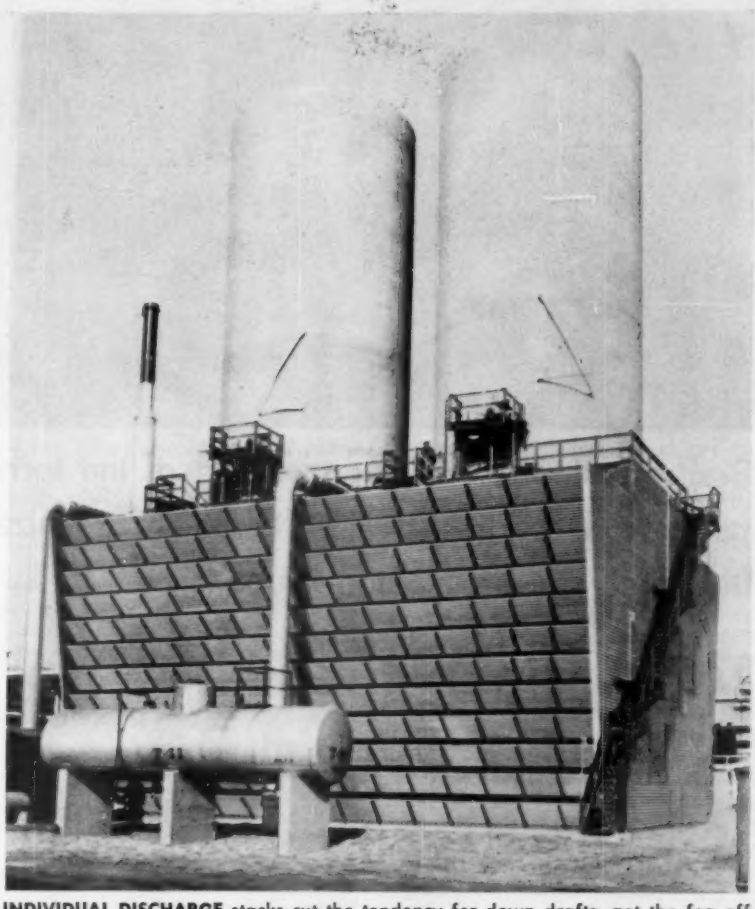
Supports consist of four columns located 90° apart around the circumference of the fan cylinder. Bracing and additional support are provided by two crosswalls connecting opposite columns and intersecting at the center of the stack. The crosswalls extend 6 ft. upward into the cylinder to provide a connecting joint and a support for the mechanical equipment. The columns, crosswalls, and cylinder were cast as a monolithic structure.

Each stack has an independent foundation, the top of which is level with the surface of the cold-water basin and forms a part of it. The concrete slab forming the rest of the basin is separated from the foundation by watertight construction joints.

Standard design criteria may be used to analyze the foundations, support, and cylinder. An analysis of the joint between the cylinder and support is quite involved and the calculated stresses would be subject to question. After investigation and consultation, the Portland Cement Association suggested that the best procedure would be to test the design by checking a scale model.

A reinforced-concrete model, scaled to one-tenth actual size, was built at the manufacturer's research and development center. A smaller model of plexiglass, one-fortieth actual size, was also built. This smaller model was used in a preliminary study in which strain gages were used to locate points of maximum stress when loads were applied from various angles.

Results of the preliminary tests were used to locate strain gages when the concrete model was tested. The concrete model was tested at the design load and stresses were well within acceptable limits. The design load was then doubled and no sign of failure occurred. The design was released for construction after its adequacy had been confirmed by these tests.

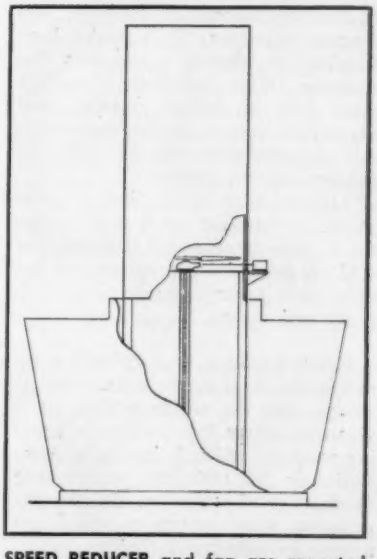


INDIVIDUAL DISCHARGE stacks cut the tendency for down drafts, get the fog off the ground. Fig. 2.

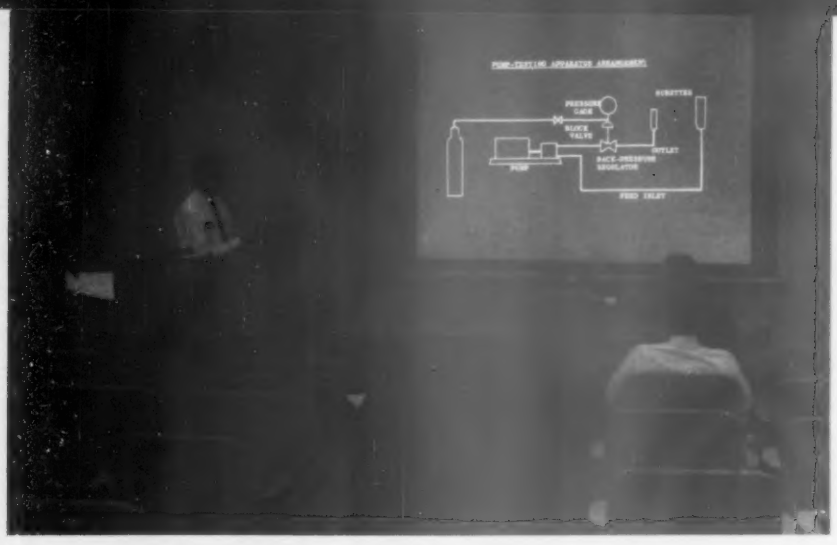
The top surface of the crosswalls provides the base for the speed reducer and fan (Fig. 3). Electric-fan motors are mounted on concrete pedestals cast on the outside of each fan cylinder. The motor and gear reducer are connected by a standard drive shaft passing through a cast opening in the stack. Stairways from the fan deck provide access to each motor.

Access is also provided to the mechanical equipment in the stack and specially designed equipment is installed for handling and removing the various components.

A track and dolly runs from one side wall into each stack. These tracks are located above the hot-water basins and enter the stack below the fan deck. A permanently installed hoist will lift the fan and hub as a unit, while another component will lift the gear reducer and lower it to the dolly. A crane on the outside of the stack will move the motor to the dolly. A ladder inside each cylinder rises from the track to a catwalk at the level of the gear reducer.



SPEED REDUCER and fan are mounted on the top surface of cross-walls. Fig. 3.



Oral reporting is an important part of the technical man's work, particularly in a research organization. That's why, at Esso's Baton Rouge lab . . .

They teach them how to tell it

A CONTINUOUS, integrated training program that places major emphasis on oral communications has been developed by Esso Research Laboratories at the Baton Rouge, La. refinery of Esso Standard, Division of Humble Oil & Refining Co.

In general, the program consists of (1) a basic science and engineering course for laboratory assistants and process operators, (2) a higher-level training for laboratory assistants that includes three semesters of college work plus on-the-job training, and (3) courses in management, economics, and advanced professional training for the professional people.

Though they can't find a good means of working up a dollar value for it, Esso management is thoroughly sold on the training program and not only plans to continue it, but to improve and expand it.

Communication. Instruction in communication is a major feature that is woven into the whole pattern of a vigorous, integrated continuous training program which is providing more flexibility for technical performance at all levels of operation. The training program, some aspects of which are unique in industry, includes:

- Communication.
- Basic science and engineering for laboratory technicians and process operators.
- Technician training, college level, for nonprofessional personnel.*
- Management and economic training.*
- Orientation for new employes.*
- Several technical short courses for professional employes.
- Continuous training in work-simplification procedures.

All this is part of Esso's approach to training: Progressive, trained manpower is the country's and the company's most important asset.

At the Esso Research Laboratories, training personnel in skills to help them perform their jobs better has always been a potent force in the research and development program. To keep pace with current growth, the program has been revamped and carefully molded into its present form.

Management reasons that the built-in communications training will help assure optimum payoff from the training program, a start on the right foot for the new employe, and a career-long awareness for all employes of communications importance. Management stresses, too, that all of its training activities are designed to improve scientific efficiency and skill in communications.

Speech. Esso stresses speech at every level of development. Behind this emphasis on oral communications is the feeling that new information in the industrial sciences loses much of its impact unless it is imparted quickly to all interested groups. Information is a salable product of industrial research and its dollar value runs high.

Concise discussion is thought to be a key factor in the effectiveness of working groups. At regular intervals most technical employes report ver-

*With refinery training department.

BY DR. L. E. SWABB, JR.

. . . assistant director of fuels research and development at the Esso Research Laboratories, Baton Rouge, La. A graduate of University of Cincinnati with BS, MS, and PhD in chemical engineering, he was a member of Tau Beta Pi and Sigma Xi, national honorary engineering societies. He has been employed by Esso Labs as engineer, section head, assistant director, and director of personnel and business administration. He has received four patents and is a member of the AIChE.

BASIC COURSES in science and engineering boost the efficiency and morale of process operators and lab assistants.

bally on their projects before other members of the technical staff. Throughout the technical employe's career, effective speech is a necessity in discussion of new processes with other research groups, other company affiliates, or firms who may license processes.

So, new professional employes are offered a public-speaking course conducted by a professor from nearby Louisiana State University. In the course, each person gives a series of 10-minute talks that are presented as typical of regular technical reports. Slides and other visual aids are used. Recordings are made of each talk, and afterwards the employe meets with the professor to hear the recording, get a critique, and work out problems. Suggestions for improvement in preparation and use of slides are included. Another university professor is retained to assist individuals with the organization and presentation of formal talks.

To back up the oral reporting, consultants are brought in to advise on report writing and other communication elements characteristic of a technical organization.

Basic course. In the past one of the barriers to verbal communication between engineer and pilot-plant operator, and between chemist and laboratory assistant, has been lack of common scientific experience. So, a basic science and engineering course was set up for laboratory assistants and process operators. The course provides a fundamental scientific language that already has begun to help lower the barrier.

Over 100 lab assistants and operators are nearing completion of 110-hour courses that present subjects of most benefit to the individual group involved. They give a brief orientation in industrial research and the basics of mathematics, statistics, physics, general and organic chemistry, unit processes, safety, work simplification, and communications.

In addition the laboratory and engineering assistants study the physical properties of hydrocarbons and instrumental methods of analyses, while the operators study fractionation and absorption, pumps and compressors, instruments, sampling, inspection, and analysis and material-balance techniques.

Evaluation of the two courses by supervisors shows that 80% of the trainees have shown improvement on the job. Process supervisors say that in keeping pilot plants running smoothly, the operators have performed a variety of jobs that they would not have been able to tackle before the course was offered. In a survey, all of the trainees indicated that they benefited from the program either on the job or in building background for their work. Laboratories management feels the morale boost alone justified the on-the-job time devoted to the classes. All note an overall uplift in performance.

Higher level training. At another academic level is the technician training course that provides technical skill and knowledge for a group of laboratory assistants. It has proved a strong aid in efforts to free the professional people of routine work so they can devote full time to creative science and engineering. The plan is carried out with the Baton Rouge refinery for the maximum benefit to all personnel. Participants are readied for more responsible work assignments in equipment design, operations analysis, project coordination, and other laboratory work.

Under this program, the trainee chooses a field of specialization from three options: chemistry, chemical engineering, and mechanical-civil engineering. Two fields of activity are embraced: formal college training at Louisiana State University, and on-the-job training under professional engineers and chemists. Two-and-a-half years of university course work are provided.

On-the-job training includes 6-month rotational assignments. During this period, the trainee is required to describe in writing the various phases of his work. He also makes oral presentations at regular meetings. Progress of the trainees, measured in tangible results reported by technical men, has been so encouraging that the program has drawn a thumping endorsement from the technical staff.

The technical man himself has further opportunity to plug educational gaps that may better his progress. A variety of "in-plant" courses is offered. Included are computing, elementary statistics, principles and application of radioisotopes, instrumentation and electrical installation and engineering for nonchemical engineers.

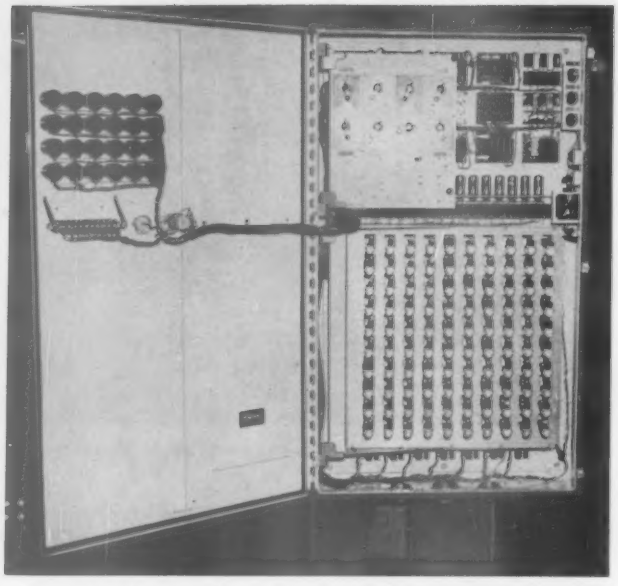
Program improvement. The research lab is not standing still with its program. Several new courses have been added for the professional personnel. These include management training and economics training (conducted in conjunction with the Esso Standard Division's Baton Rouge Refinery), and a series of "Advanced Professional Training" courses.

The economics course was added because few engineers have had training in economic evaluation of refinery processes. Completed is one 4-6 hour economics course in the fuels process field. Another is planned to cover economics of the petrochemicals field.

Most recently added is the series of Advanced Professional Training courses. Conducted by nationally recognized authorities, the courses have a twofold purpose: (1) to keep the technical men in contact with the fundamentals of their scientific training, and (2) to keep them abreast of new developments in fields of science other than those most closely related to their regular duties.

During the intense, 2-week lecture series, various advanced topics of technical interest are presented to groups of about 16. A typical series for chemical engineers might be, "Heat and Mass Transfer and Other Rate Processes." Individuals are selected for a course on the basis of special need and appropriate background. Those chosen devote full time to the course. Maximum interchange of ideas between student and visiting professor is encouraged. Assignments are made and outside reading is required.

VIEWS of Power Level Controller show front (Fig. 1) . . .



Interior, exposing two types of relays (Fig. 2) . . .

Shell computer provides local-automatic

without attendant or communications, and

BY R. D. PFLUGER
Engineer, Shell Pipe Line Corp.

A LOCAL-AUTOMATIC controller developed by Shell Pipe Line Corp. achieves complete control of a pump station without full-time attendance or a communications link between the central operator and the station.

Designated a Power Level Controller, the device will greatly simplify the job of the local operator or central dispatcher, and will insure better operation. The controller will automatically switch units, select the proper operating level for the station when malfunctions occur, and automatically adjust the operating level of the station to meet hydraulic conditions. By continuously monitoring the station, it can act before a manual operator would be aware of conditions that require corrective action.

Control devices of this nature are believed to have a definite place in pipeline automation, both on systems now operating and those that will be built in the future. The local-automatic philosophy of control properly and fully applied becomes a very essential link in the pipeline control-system chain.

In essence, this philosophy places the control device directly at the point to be controlled. By so doing, the control loop is closed; the only external control function required is the periodic adjustment of the set level of the station to comply with station maximum power-demand requirements and pipeline flow rates.

If remote control, remote monitoring, or computer control is considered necessary, a simplified system can be economically installed using the new-model controller as a part of the system. This will assure continuous operations during outage of the communications system, remote-control system, or the computer, and will definitely contribute to the need for a smaller and simpler control computer.

In completing the automation of Ozark Pipe Line, which is operated by Shell Pipe Line, our company plans to install a new-type controller at each of five stations and to operate these stations unattended and without communications; thus, a considerable capital savings will be realized. Southwestern Industrial Electronics Co. (SIE) has been licensed to manufacture the controllers.

Background

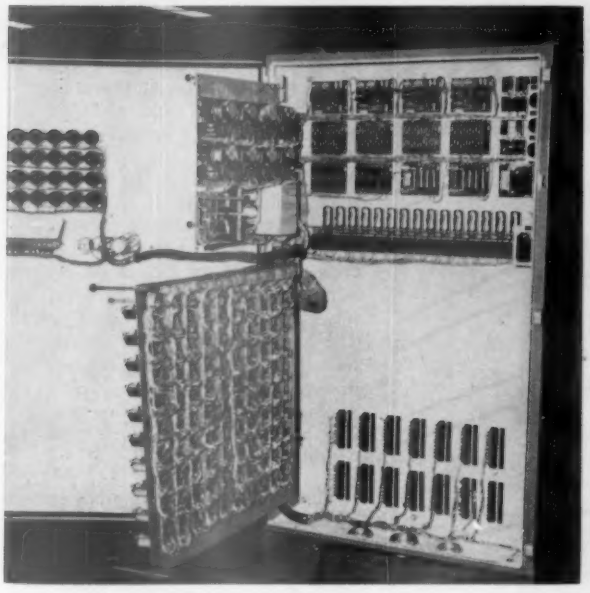
Automation of petroleum-pipeline pump stations has in general followed one narrow path, that is, the use of remote-control facilities to bring the control of several pump stations within reach of one central operator. This method of automation has resulted in an improvement from an economic viewpoint.

However, from an operations viewpoint, it has several weaknesses. Among these are: (1) vulnerability of control to communications and remote-equipment outages, and (2) excessive burden on the central operator due to menial tasks that he must perform to control each station.

After experiencing these troubles with remote control, it became apparent that to eliminate all of the problems, a form of local-automatic control would be needed. Local-automatic control had been used quite extensively and successfully on one and two-pump unit stations which required only a minimum of built-in control intelligence, but never, to our knowledge, on a four-pump unit station on a multistation, high-capacity pipeline.

A market search for a local-automatic control system revealed that none was available. But several manufacturers indicated an interest in building the control device to our specifications, and at an attractive price.

To determine the feasibility of this



Interior with relay panels swung out (Fig. 3) . . .

And local control panel (Fig. 4).

control • New power-level controller operates pump station

reduces power costs

type of automation and the operating requirements of the control device, a control simulation study was performed. A preliminary study was made using an analog computer set up as a mathematical model of a 435-mile 10-station pipeline which was being considered for further automation. Each station has four pump units.

The analog computer was chosen because of the ease of insertion of data, and the logic of the control system is simulated manually; thus, no extensive programing changes are required when examining radically different logical procedures. The analog-computer simulation was performed using the characteristics of an average crude oil and was intended to outline the control-system logic that would be required.

Upon completing this phase and determining the control-system logic, a program was written using a digital computer.[1] This latter method allowed us to evaluate the effects of various crude characteristics upon the operation and stability of the control system and the pipeline.

After control-simulation studies were completed, specifications for the manufacture of a prototype controller were written. Arrangements were made with SIE for the detailed design and manufacture of the instrument.

A prototype model of the controller was built to test under field conditions the local-automatic control philosophy. (Figs. 1-4).

In Fig. 1 is shown a front view of the controller. Located on the front door are the adjustable incrementation and decrementation pressure set points, the on-off switch, the pump preference selector, and a manually set limit switch to establish the maximum power level at which the station may operate. This latter item was added as a safety feature to prevent the accidental setting of the station at a level greater than desired.

An interior view of the controller is shown in Fig. 2. On the top hinged panel are located the time-delay relays; on the lower hinged panel are the telephone-type relays required to accomplish the logic functions of the controller.

Fig. 3 is an interior view of the controller with the relay panels swung out. Located beneath the time-delay relays are the power supplies, one for the pressure set points, the other for relay drive. The pressure-sensing amplifier-comparators (4) are the small modular boards in the top row on the back panel of the enclosure.

The remaining modular boards are power supplies and output relays for the amplifier-comparators and boards of diodes used for "or" logic and d.c. voltage isolation. The tubelike devices are latch-type mercury wetted relays which provide memory to the controller. At the bottom of the controller are the terminal points for interconnections between the controller, switchgear, and control panel.

The local control panel is shown in Fig. 4. From this panel an operator can control and monitor the operation of the station.

Extensive field tests have been performed to evaluate the operation of the controller. Abnormal conditions were created at the control station as well as at other stations along the pipeline in order to simulate operating upsets which might occur. In every case the controller performed as required. In the 5 months since first tests, the instrument has remained in control of the pump station which has been operating unattended and without communications with completely satisfactory results. During this period a change in power level has been required on an average of twice per day.

How Controller Functions

The prototype controller was designed to control automatically the operation of a four-pump-unit pipeline station. The units are electrically driven constant-speed centrifugal

pumps equipped with sequentially operated switchgear and a complete protective-device scheme.

The pump station is equipped with a pressure-control system which includes a throttle valve and a suction-discharge pressure controller.

The horsepower ratings of the pumps at this station are: Unit 1—750 hp., Nos. 2 and 4—1,250 hp., and No. 3—1,500 hp. These are piped so that any combination of units may be run together; thus, the hydraulic boost provided by the stations can be varied in incremental steps by changing the combination of pumps that are operating. To each combination has been assigned a numerical value representing the relative power furnished. This designation is referred to as a power level.

TABLE 1—POWER LEVELS AVAILABLE

Power level	Pump unit combination	Horsepower
0	None	0
1	1	750
2	2 or 4	1,250
3	3	1,500
4	1 & 2 or 1 & 4	2,000
5	1 & 3	2,250
6	2 & 4	2,500
7	2 & 3 or 3 & 4	2,750
8	1, 2 & 4	3,250
9	1. 2 & 3 or 1, 3 & 4	3,500
10	2, 3 & 4	4,000
11	1, 2, 3, & 4	4,750

Shown in Fig. 5 is a graph of pressure boost versus throughput rate for these power levels at a typical station.

As the name implies, the controller regulates the power level at which the pump station operates. This is accomplished by use of logical circuitry which has sufficient intelligence to perform the following functions:

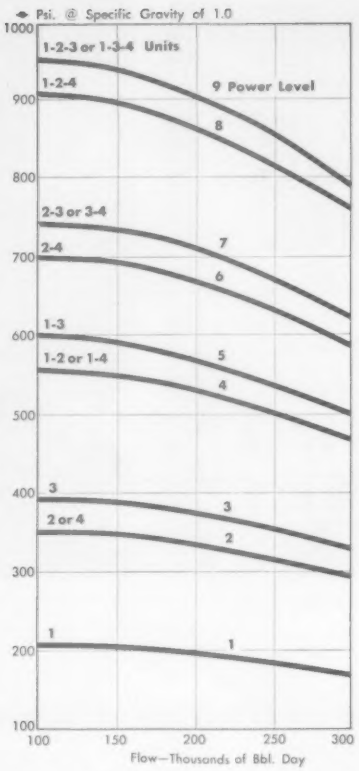
1. Increase the operating power level of the pump station provided that (a) the station is operating below the desired power level and (b) the hydraulic condition of the pipeline will permit.

2. Decrease the operating power level of the pump station if excessive throttling exists across the station throttle valve.

3. Operate the station at an alternate power level if the desired power level is inoperative due to a locked-out pump unit or units.

4. Automatically start and stop the pump units in the proper sequence as required by the conditions listed above or upon a command for a power-level change as would be required to change the throughput rate of the pipeline.

All of these control features are accomplished locally and automatically. The only operational duty to be performed manually is selection or change of the power level at which the station is to operate. The frequency of the selections will vary from pipeline



GRAPH of pressure boost vs. throughput rates at a typical station. Fig. 5.

to pipeline, but in general, a power-level change will be made only when required to achieve over-all power-cost optimization. The station will operate itself at the selected power level, or as near to this power level as hydraulic conditions or malfunctioning pump units will permit.

Operating Sequence

The controller follows a definite sequence of operations when increasing or decreasing the operating power level. This sequence is determined by the desired level at which the station is to operate, and this sequence has been designed so that incrementation and decrementation can be accomplished with only a minimum number of pump-unit condition changes.

To illustrate this sequence, the following listing shows the steps that would be required to bring the station from a shutdown (power-level 0) condition to power-level 8.

TABLE 2—STEPS TO INCREASE POWER LEVEL

Step	Power level	Pump units operating
Initial	0	None
1	2	4
2	4	1 & 4
3	6	2 & 4
4	8	1, 2 & 4

The controller will follow this same sequence, except in the reverse order, to decrease the operating power level. Pump unit 1 is run at power-level 4 and then stopped and restarted for power-level 8. This requires one extra start on this unit, and is included in the sequence so that the incremental steps will be as small as possible to reduce transient pressure surges.

The operating power level is increased only when the station is operating below the set power level and the hydraulic conditions will permit. The hydraulic conditions which must be satisfied before raising the level are minimum flow, minimum suction pressure, and maximum case pressure. The purpose of these three hydraulic conditions is as follows:

Minimum flow. A minimum amount of flow must be established to prevent static pressures in the pipeline under no-flow or line shutdown conditions from starting the pumps.

Minimum suction pressure. A minimum amount of suction pressure is required before the operating power level can be increased, thus insuring that the larger power level will not pull down the suction pressure to a point below the rated minimum NPSH of the pumps.

Maximum case pressure. The case pressure of the station must be below a maximum value before incrementation is accomplished, to prevent the larger power level and pressure boost from exceeding the pipeline pressure limit.

All three of these hydraulic conditions must be satisfied for a preset time before the incrementation step is started and up until the time that the step has been accomplished. If any of these conditions violates the set limits during this time, the incrementation is aborted; the pump station is allowed to operate at the original power level until the hydraulic conditions are again within limits.

This procedure of examining the hydraulic conditions and then incrementing the power level is repeated until the pump station is operating at the desired power level.

The operating power level of the station may be decreased by two methods. The first is to lower the operating power level in the sequence described previously or to lower the operating level by a two power-level step. This method of decrementation is used when a pressure in excess of approximately 40% of the pressure boost furnished by this two power-level step has been throttled by the station throttle valve for some 10 minutes.

This condition of throttling would exist when one of the adjacent pump stations has a malfunctioning pump unit, the line throughput rate is changed, or by viscosity differences in the oil stream adjacent to the station. The percentage of throttled pressure stated above was determined through the control-simulation studies as being optimum value. The value of 10 minutes allows time for a malfunctioning unit to be restarted.

The second method of decrementation is to shut down the upstream pump unit when the throttled pressure exceeds 75% of the pressure boost furnished by this unit for about 30 seconds. A throttled pressure of this magnitude would be caused by shutdown of an adjacent station or some other major fault.

The purpose of these decrementation schemes is to eliminate as nearly as possible any throttled pressures and consequent sources of wasted power.

The time-delay action built into both the incrementation and decrementation schemes is to prevent action by the controller during transient pressure conditions.

In addition to controlling the operation of the station by increasing and decreasing the power level to meet the hydraulic conditions, the power-level controller will also choose an alternate power level at which to operate the station if the desired power level becomes inoperative due to a locked-out unit. By referring to the listing of power levels, you can see that pump units 1, 2, and 4 are required to achieve power-level 8.

If any of these units becomes locked out due to the action of a protective device, this power level is inoperative. The controller will then choose the next lower power level which can operate and does not include this locked-out unit. If unit number 4 were locked out, the controller would then operate the station at power-level 7 or units 2 and 3. When the malfunction on unit number 4 is corrected and the unit is restored to service, the controller will then operate the station at the desired power level or power-level number 8.

Several of the power levels may be achieved by operating either pump unit number 2 or 4 since these units are identical in size. A control is provided on the front cover of the controller to enable the operator to select which of these units is to run when this choice exists. This selection will be voided if the preferred pump unit is locked out.

Reference

1. Young, T. R., "Digital Simulation of Crude Oil Pipelines": The Oil and Gas Journal, May 2, 1960, p. 161.

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Turnkey slim-hole jobs slice costs for Mississippi wells

BY J. W. ARNOLD
Vice President, Woolf & Magee, Inc.,
Tyler, Tex.

This author reports...

Operators in Mississippi have a new cost-cutting tool. They are letting turnkey contracts for drilling slim holes.

In addition to the great saving that results from use of smaller casing, tubing, and related well equipment, there is also a saving in actual drilling costs. Our company has drilled approximately 1 million feet of Mississippi slim hole. As a result of this experience, our slim-hole drilling rates now compare favorably with those for conventionally sized holes.

THE PRESENT slim-hole drilling activity began in Mississippi in August 1954. There may have been isolated cases prior to this time, but this date marks the start of continuous and ever-increasing slim-hole activity in this area. From the beginning, contracts called for the contractor to furnish third-party services—so-called "turnkey contracts."

Reason for the turnkey features at first was that the operators mostly were small independents and promoters. These people were interested in the savings of slim-hole drilling, but hesitated because they lacked experience in this new drilling method.

Our company had experience in adjacent Louisiana areas which revealed enough about existing conditions to make a turnkey package contract possible.

All slim-hole work was for exploration at first and much of it is now. This method yields a hole at minimum cost to look at the sand. In some instances, provisions were made to ream the slim hole and use conventional 5½-in. o.d. casing for a completion string.[2]

Paper presented under title, "Turnkey Slim-Hole Drilling, Mississippi," at 1960 spring meeting of API Division of Production's Southern District, San Antonio.

Records of the Mississippi Oil and Gas Board show the trend toward slim-hole completion of wells in the state. The wells in Table 1 were completed with single production strings of casing smaller than 5½-in. o.d. They do not take into account conventional-size holes completed with dual or triple strings of tubing as tubingless completions.

Slim-hole drilling tools and techniques have developed relatively slowly, awaiting acceptance of slim-hole completion methods. Now that small-diameter completions and the tubingless-completion method are more widely accepted, emphasis may be placed on drilling tools and methods to provide desirable minimum-size hole for each size casing string.

For our purpose, "slim hole" covers the range from 4¾ in. to 6¾ in. Most emphasis is on the 5⅝ to 6¼-in. range. Although some 11 wells representing 71,900 ft. of 4¾-in. hole were drilled in Mississippi in 1954 and 1955, this hole size has been temporarily abandoned in favor of the 5⅝ and 6⅛-in. sizes because bit performance is better.

Of the 125 slim holes drilled by our company in Mississippi, average depth was 6,693 ft. This is a total of 836,584 ft. of hole. Most of these wells have been Wilcox-sand tests with the deeper wells testing the Upper and Lower Cretaceous.

TURNKEY PACKAGES such as this slim-hole operation in Sharkey County, Miss., have helped keep drilling costs down.

TABLE 1—WELLS COMPLETED IN MISSISSIPPI WITH SINGLE CASING STRINGS LESS THAN 5½-IN. O.D.

Year	No. of wells
1956	0
1957	0
1958	8
1959*	20

*Through November.

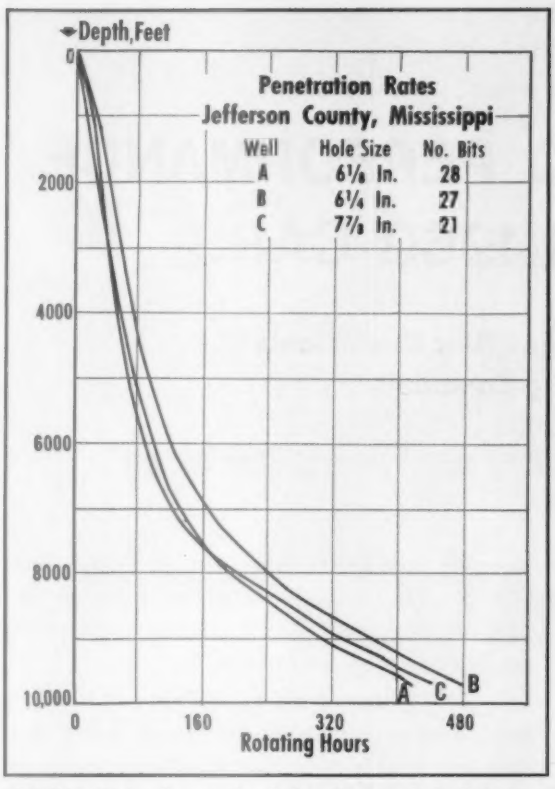
Program and Equipment

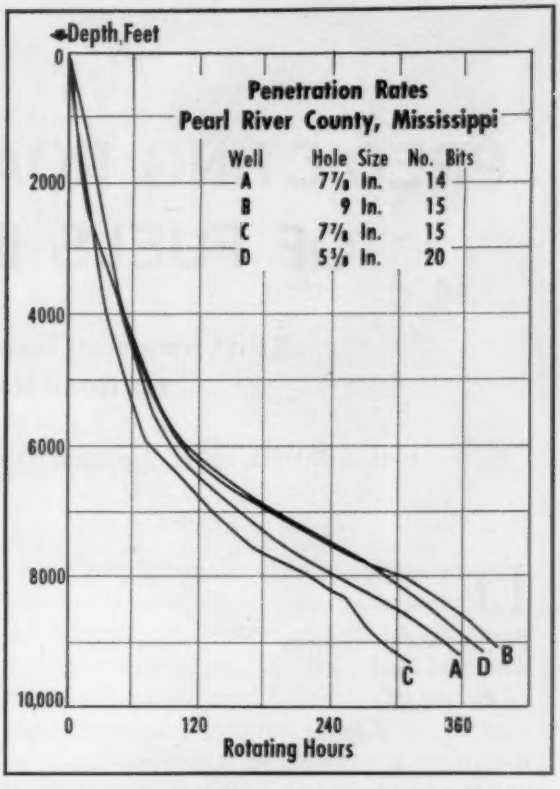
Here is how a representative drilling program in this area might divide responsibilities for supervision and performance. The operator would furnish the permit and stake location. He would also set out specifications for work to be performed including:

1. Hole size.
2. Surface casing (size and amount).
3. Mud limitations (whether oil may be used and any special weight, viscosity, or water-loss requirements).
4. Coring and logging.
5. Special requirements (items not regarded as normal procedure such as special straight-hole surveys, reports, and time limits).
6. Completions or plugging requirements.

The contractor would:

1. Build necessary roads and locations.
2. Move rig on location, rig up, and drill surface hole.
3. Procure surface casing, cement,





DRILLING IN harder sands, shales, lime and chalk below the Wilcox formation in Jefferson County (Fig. 1, left) and in Pearl River County (Fig. 2, right). In harder drilling, there was greater variation in number of bits used.

and cementing service and set surface casing.

4. Procure mud and plan mud program subject to contract limitations.

5. Drill hole of required size to contract depth.

6. Perform logging and coring operations specified, including furnishing necessary third-party services.

7. If dry and abandoned, furnish materials and services to plug well according to regulations.

8. Perform necessary cleanup and surface restoration.

If production is found, contractor sets casing at direction of operator.

Personnel. In all phases of the drilling program, contractor's tool pusher and other personnel are available to perform routine matters that arise on the job. This eliminates duplication of effort on the part of operator and contractor. There is now a premium on the efficient use of manpower. Thus, making the contractor's personnel responsible for road and

TABLE 2—HOLE-SIZE LIMITATIONS OF DOWN-HOLE LOGGING AND TESTING EQUIPMENT

Instrument—	Slim-hole sizes, in. 5⅝	6⅛	6¾
ES Sonde	Yes	Yes	Yes
Continuous dipmeter	No	Yes	Yes
Photoclinometer	Yes	Yes	Yes
Induction - ES combination	Yes	Yes	Yes
Gamma ray	Yes	Yes	Yes
Gamma ray - neutron	Yes	Yes	Yes
Sidewall sampler	Yes	Yes	Yes
MicroLog	Yes	Yes	Yes
Section gage	Yes	Yes	Yes
Laterolog	Yes	Yes	Yes
Sonic	No	Yes	Yes
Formation tester	Yes	Yes	Yes

TABLE 3—RELATIVE WELL COSTS—PEARL RIVER COUNTY, MISSISSIPPI, TUSCALOOSA FORMATION—9,200-FT. TOTAL DEPTH

WELL SPECIFICATIONS			
Surface casing (980 ft.), in.	9⅝	8⅝	7
Hole size under surface, in.	8¾	6⅛	5⅝
Size production string, in.	5½	4½	2⅞
Size tubing string, in.	2½	2	...
DRILLING COST			
Contract cost	$36,800	$30,000	$30,000
Surface casing	3,600	2,800	2,000
Mud	1,900	1,300	1,200
Total	$42,300	$34,100	$33,200
Per cent of conventional-hole drilling cost	100	81	79
COMPLETION COST			
Production string	$20,200	$14,400	$8,400
Tubing	8,400	6,400	.....
Total	$28,600	$20,800	$8,400
Per cent of conventional-hole completion cost	100	73	30

PREDICTING ROAD PERFORMANCE OF FUELS IN 1960 CARS

Ethyl Research Develops New Coefficients for Road Rating Equations

by **H. J. SEWELL**, *Refinery Technology Division, Ethyl Research Laboratories, Detroit, Michigan*

Data on the road performance of gasolines are essential for selecting the most economical processing or additive route to produce the fuel antiknock quality that will meet the changing needs of the car population. There is little doubt that road tests provide the best yardstick for measuring the ability of gasolines to satisfy individual cars and the car population. However, road testing is both costly and time-consuming.

To help refiners save time and money, Ethyl developed a now widely accepted procedure for calculating road octane performance from routine laboratory test data. Now Ethyl has computed new equation coefficients with which road ratings may be calculated for 1960 cars, using both the Modified Uniontown and Modified Borderline methods. Coefficients have been developed for road ratings during part-throttle operation as well as at full-throttle.

Here's The General Equation

The relationship of road performance to laboratory variables is expressed in the following equation:

$$\text{Road ON} = a + bR + cM + dO$$

where R = Research octane number
M = Motor octane number
O = Olefins, vol %

a, b, c, and d are equation coefficients for particular cars and tests. The coefficients for premium gasolines based on ratings in four 1960 premium-fuel cars are shown in Table I.

Since the antiknock effect of TEL is greater on the road than in the laboratory, it follows that adding a TEL factor to the general equation significantly improves predicting accuracy. These new coefficients are shown in Table II.

Use of the Equations

Experience with these equations has shown that they are useful in calculating road performance of fuels that are similar in antiknock quality and hydrocarbon composition to those used in the development program.

Since a wide range of full-boiling commercial gasolines was used to develop the Ethyl equations (Table III), they can be used for almost all current gasolines.

Although road octane numbers assigned to gasolines by one vehicle are not necessarily reproducible in other vehicles of the same make and model, experience has shown that *relative* fuel ratings are consistent from car to car.

Ideally, therefore, the equations should be used to *compare* the road performance of gasolines rather than to obtain the road octane number of a specific fuel. In fact, the same reasoning also applies to experimental road-rating results.

Many refiners have found these equations useful in:

1. Analyzing the effects of laboratory properties on road performance when designing current motor fuels;

2. Predicting future trends in the road performance of motor fuels.

TABLE I

Equation Coefficients for Premium Fuels (4-Car Average)

Road ON = a + b(RON)+c(MON)+d(% Olefins)

		a	b	c	d	Stand. Error
Modified Uniontown		37.081	0.268	0.391	–0.041	0.59
Modified Borderline	2000 rpm	24.673	0.473	0.316	–0.020	0.61
	2500 rpm	24.966	0.457	0.319	–0.036	0.66
	3000 rpm	24.738	0.381	0.394	–0.059	0.76
	3500 rpm	16.257	0.345	0.517	–0.079	0.84

TABLE II

Equation Coefficients for Premium Fuels, TEL Factor included (4-Car Average)

Road ON = a + b(RON)+c(MON)+d(% Olefins)+e(ml TEL/gal.)

		a	b	c	d	e	Stand. Error
Modified Uniontown		42.942	0.273	0.313	–0.048	0.289	0.53
Modified Borderline	2000 rpm	31.851	0.479	0.221	–0.028	0.354	0.51
	2500 rpm	34.266	0.465	0.195	–0.046	0.484	0.53
	3000 rpm	34.341	0.389	0.266	–0.070	0.474	0.65
	3500 rpm	25.702	0.353	0.391	–0.089	0.466	0.72

TABLE III

Full-Boiling Premium Fuels Used To Develop Coefficients

Variable	Range	Average
Research Octane Number	96.7—104.3	100.4
Motor Octane Number	84.2—97.1	90.6
Aromatics, vol %	7—57	27
Olefins, vol %	1—46	20
Saturates, vol %	34—87	53
TEL, ml/gal	2.0, 4.0	

How Ethyl Research can help you

Three publications that will enable you to calculate gasoline road performance from laboratory test data are available:

1. "Road Octane Correlations for Premium Gasolines, 1960"
2. "Road Octane Correlations for Regular Gasolines, 1960"
3. "Part-throttle Road Octane Correlations for Premium Gasolines, 1960"

Copies of these reports are available from your Ethyl Representative, or by writing Ethyl Corp., 100 Park Ave., New York 17, N. Y.

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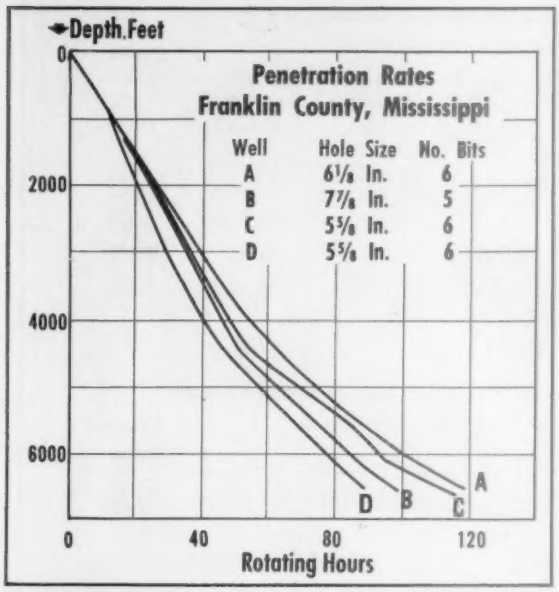

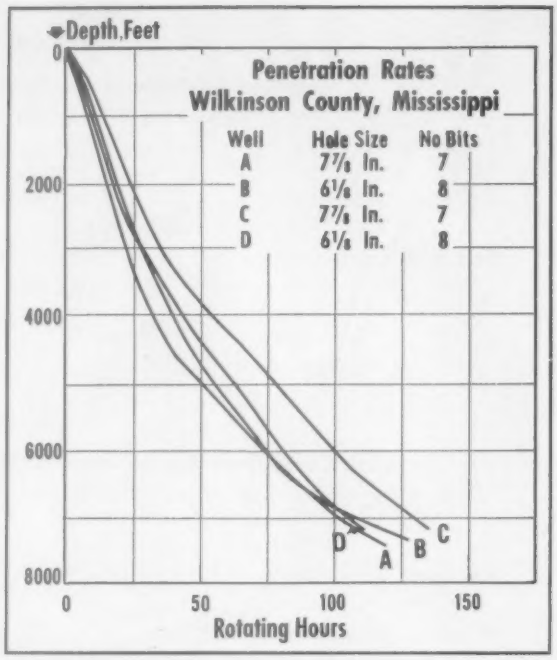

PENETRATION RATES in relatively soft drilling to the producing formations are shown for Franklin County (Fig. 3, left) and Wilkinson County, (Fig. 4, right).

location preparation, running surface casing, supervising the mud program, and the like is an economic benefit.

Rig equipment. To date practically all of the slim hole in Mississippi has been drilled with the following type rig equipment.

Derrick: 94-ft. trailer-mounted cantilever drilling mast, 300,000-lb.-capacity, 8-ft. 8-in. substructure.

Draw works: 250 to 300-hp. draw works with air controls, auxiliary brake, torque-converter drive.

Power: One six-cylinder, natural-gas or butane engine 266 maximum horsepower.

Pump: 7¼ by 12-in., skid-mounted with one six-cylinder natural-gas or butane engine 266 maximum horsepower torque-converter drive.

Rotary: 17½-in., 200-ton capacity.

Traveling block: 100-ton capacity.

Hook: 60-ton capacity.

Swivel: 60-ton capacity.

Drill pipe: 2⅞-in. o.d. 6.5-lb. N-80 tubing with 2⅞-in. API internal-flush tool joint 4⅛-in. o.d., 2⅛-in. i.d.

Drill collars: 4¼ in. o.d. by 2⅛ in. i.d. by 30 ft. and 5 in. o.d. by 2¼ in. i.d. by 30 ft.

Rigs of this general type and size have drilled wells ranging from 3,000 to 10,000 ft. Admittedly, this wide depth range does not use rig equipment most efficiently. However, the demand for such equipment does not justify great numbers of rigs with only slight differences in capacities.

With the average depth of slim holes drilled being near 6,700 ft., the foregoing type rig is entirely adequate. However, the trend to deeper drilling and completions with 4½-in. o.d. and

TABLE 4—RELATIVE WELL COSTS—JEFFERSON COUNTY, MISSISSIPPI, TUSCALOOSA FORMATION—9,500-FT. TOTAL DEPTH

WELL SPECIFICATIONS			
Surface casing (1,055 ft.), in.	9⅝	8⅝	7
Hole size under surface, in.	8¾	6⅛	5⅝
Size production string, in.	5½	4½	2⅞
Size tubing string, in.	2½	2	...
DRILLING COST			
Contract cost	$40,000	$34,500	$34,500
Surface casing	3,900	3,000	2,100
Mud	4,300	1,800	1,500
Total	$48,200	$39,300	$38,100
Per cent of conventional-hole drilling cost	100	82	79
COMPLETION COST			
Production string	$20,700	$14,800	$8,700
Tubing	8,700	6,600	.....
Total	$29,400	$21,400	$8,700
Per cent of conventional-hole completion cost	100	73	30

TABLE 5—RELATIVE WELL COSTS—FRANKLIN, ADAMS, WILKINSON COUNTIES, MISSISSIPPI, WILCOX FORMATION—7,000-FT. TOTAL DEPTH

WELL SPECIFICATIONS			
Surface casing (580 ft.), in.	8⅝	7	7
Hole size under surface, in.	7⅞	6⅛	5⅝
Size production string, in.	5½	4½	2⅞
Size tubing string, in.	2½	2	...
DRILLING COST			
Contract cost	$13,300	$12,200	$12,200
Surface casing	1,700	1,200	1,200
Mud	300	300	300
Total	$15,300	$13,700	$13,700
Per cent of conventional-hole drilling cost	100	90	90
COMPLETION COST			
Production string	$13,000	$10,500	$6,400
Tubing	6,400	4,800	.....
Total	$19,400	$15,300	$6,400
Per cent of conventional-hole completion cost	100	79	33

smaller casing can create a demand for equipment with slightly greater depth ranges. The drilling equipment available can go to its maximum depth range by using lightweight drilling pipe or drill tubing. Such strings are essential from the standpoint of initial costs, hydraulics, and weight factors.

Deeper slim holes present hydraulic problems in their low volumes and high pressure requirements. Successful short-stroke conventional duplex pumps or plunger-type pumps may solve this problem.

Drilling Practices and Costs

Subject to local area conditions the following represent general drilling practices:

Rotary speed: 80 to 150 r.p.m.

Bit weights: On 5⅝-in. bit, 8,000 to 14,000 lb. Or, on 6⅛-in. bit, 8,000 to 20,000 lb.

Circulation rates: 140 to 190 g.p.m.

Annular velocities: In 5⅝-in. hole, 145 to 200 ft. per minute; in 6⅛-in. hole, 120 to 160 ft. per minute.

Jet velocities: 195 to 265 ft. per second.

Mud properties: Weight—9.2 to 9.8 lb. per gal., viscosity—32 to 45 seconds; water loss—10 to 15 cc.

With only few exceptions, tools are available for logging and testing in slim holes. Table 2 shows those tools available to run in 5⅝, 6⅛, and 6¾-in. holes. In addition, drill-stem testing and diamond-coring equipment is available for all three hole sizes.

Completion tools for working in casing as small as 2⅞-in. o.d. are generally available.[3,4]

Drilling speed. Figs. 1, 2, 3, and 4 compare drilling rates for slim and conventional holes in four counties in Mississippi. These curves show representative penetration rates during 1958 and 1959 for a number of different contractors.

Figs. 3 and 4, covering penetration rates in Franklin and Wilkinson counties to the Wilcox formation, are the best comparative results. These rates came in relatively soft drilling to the producing formations.

Figs. 1 and 2 are for drilling harder sands, shales, lime, and chalk below the Wilcox formation in Jefferson and Pearl River counties. Slim-hole penetration rates are good in these areas. However, in the harder drilling, there is greater variation in the number of bits used. Faster bearing wear in the small bit results in shorter bit life.

Cost to drill, complete. Given satisfactory penetration rates, the slim-hole rig competes with the conventional rig on the following basis:

1. Lower moving cost—less weight to move.
2. Lower rig-up and rig-down cost—unitized or trailer-mounted rigs with minimum of equipment.
3. Lower daily operating cost—maintenance, fuel, labor, depreciation.
4. Cheaper surface casing.
5. Mud costs are lower since smaller volumes are treated.

Tables 3, 4, and 5 show drilling and completion costs on slim holes and conventional holes in three areas of Mississippi.

Drilling cost is from 10 to 21% less compared to conventional practices. Savings are 21 to 70% in completion costs, depending upon the reduction in producing string size.

These cost figures do not take into account the savings to the operator directly attributed to turnkey features alone.

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3. Petroleum Equipment: "Stekoll Petroleum's Tubingless Completions," Sept.-Oct. 1959.
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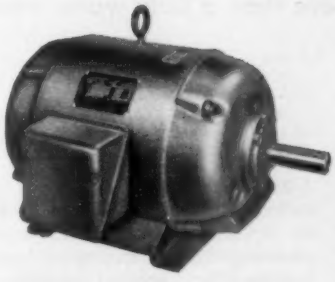

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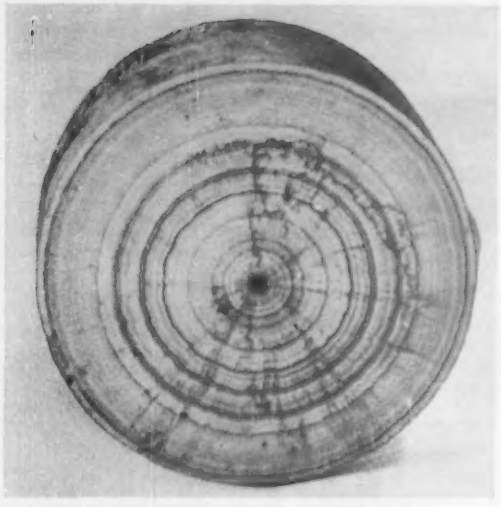
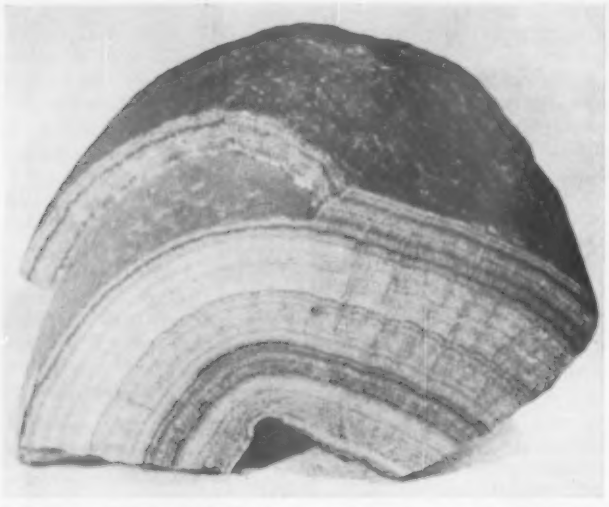
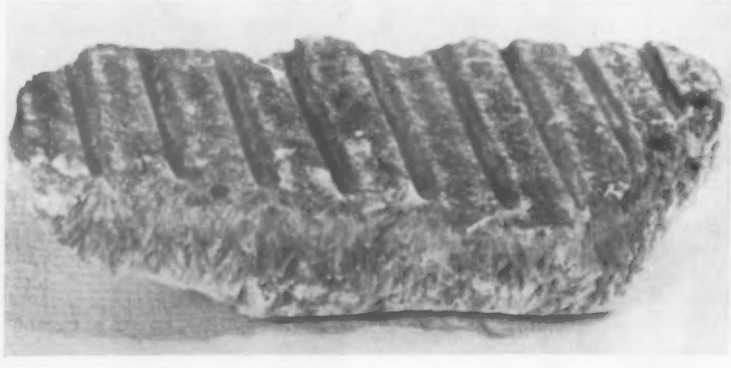


BARIUM SULFATE DEPOSIT which entirely filled a 3-in. bull plug placed at a turn in a line carrying mixture of barium and sulfate waters. Fig. 1.



BARIUM SULFATE DEPOSIT from a mixing basin, Osage County, Oklahoma. Approximately 2,000 bbl. per day of Bartlesville (barium) brine and 6,000 bbl. per day of Arbuckle (sulfate) brine caused the deposition of an estimated 475 lb. per day within the basin, lines, and disposal well. Illustration near actual size. Fig. 2.

GYPSUM DEPOSIT which formed in 25 days on pump screen as a result of mixing waters from two or more zones in Permian red beds. Approximately actual size. Fig. 3.



. . . Here's why you have to . . .

Watch those mixed injection waters

• Plugging of pipe, formations, screens, and filters can result from the mixing of waters containing various elements. Repairing damage from precipitation can cost a lot more than a little water treatment.

BY L. C. CASE
Consultant, Tulsa

INCOMPATIBLE WATERS, though harmless by themselves, may create costly problems if used together. Undesirable reactions usually result in the accumulation of deposits.

An example of less common incompatibility would be corrosion induced by addition of oxygen-containing fresh water to a heavy brine prior to injection. Chemical incompatibility may also result from the use of additives which may react with one another and cause undesirable side effects.

The examples and discussion which follow will be limited to the interactions of natural waters in an effort to supplement what we know about problems due to mixing of injection waters. The chemical reactions are rather simple and water analyses usually make these reactions readily apparent. However, it is more often than not an error to conclude that the indicated combinations will be troublesome unless the conditions of use are known in detail and correctly interpreted. In other words, a certain degree of incompatibility may be tolerated with economic benefit in many cases if there are no changes in operating conditions.

Quite naturally, supply water source is dictated first on availability. Where supply water and formation brine are known to be incompatible to a high degree, a change in supply water is advisable, if possible. On the other hand, the amount of plugging may be open to question due to conditions of use,

such as salinity, temperature, pH value, time, agitation, etc.

Solubility data in the literature are usually inadequate to predict the exact results when two given waters are mixed in certain ratio. This is true because the effects of salinity and composition of natural brines have not been fully investigated. Until these data are more complete, it is believed that borderline examples of incompatibility should be critically examined in view of documented case histories. Further, if such critical examination should fail to establish clear-cut decisions, test nipples should be used in injection lines before resorting to costly change in supply water or preventive chemical treatment.

The most common deposits formed due to mixing of natural waters are composed largely of the sulfates of barium, strontium, and calcium; calcium carbonate; iron sulfide; and iron oxide. Some examples of these deposits are illustrated, with discussion as to origin, predicted and actual troubles, remedial methods, and other data pertinent to the planning and operation of water floods. It is hoped that the examples will serve as a practical approach to the question of compatibility and that the errors of past years, based solely on solubility data with "pure" solutions, may not be repeated.

Barium Sulfate

Occurrence of barium sulfate-type deposits and their identification have been described in the literature.[1 2 3 4] The deposit rarely exceeds 50% $BaSO_4$ but common impurities of strontium and calcium sulfates, iron oxide, oil and inert matter do not add to acid solubility if alkaline earth carbonates are also low. Thus accumulations of the scale are generally hard and insoluble, causing serious removal problems. Prevention is best effected by avoiding mixtures of waters having barium with others having sulfate. Barium commonly occurs in the waters of Pennsylvanian horizons of the Mid-Continent. But its presence cannot be predicted with certainty except in a few areas in the Bartlesville sand. It follows that chemical analysis should precede the mingling of any waters.

Since the state of combination of ions and radicals present in a water are not precisely known, the essential reaction is:

$$\frac{Ba^{++}}{137.37} + \frac{SO_4^{--}}{96.064} = \frac{BaSO^4}{233.434}$$

In this reaction one part of sulfate is equivalent to 1.43 parts barium, or, one part barium is equivalent to 0.699 parts sulfate. On this basis we may estimate the amount of deposit formed when two waters are mixed and which element or radical the stabilized mixture will contain in excess. Actually, the reaction is not complete except at very low pH, with high temperature and several hours' time. Also, the handbook values for solubility of 2.2 milligrams per liter (mg./l.) at 64° F. to 3.36 mg./l. at 122° F. are for distilled water only. The solubility of barium sulfate is shown to be much higher in high-chloride brines but existing data are not exact. The occurrence of published brine analyses showing appreciable quantities of both barium and sulfate show that certain amounts of each remain in solution when salinity is high. The data in Table 1 are stated to reflect most of the barium and a portion of the strontium in these brines.

Table 1—Barium and Sulfate in Brines.
(Data from USBM RI No. 4974, 1953)

Sp. Gr.	Ba	SO_4	Ba, as $BaSO_4$ mg./l.
1.110	26	135	44
1.127	24	205	41
1.094	11	53	19
1.107	23	134	39

Note that sulfate is in excess, in all analyses, and that in the order of 20-50 mg. per liter $BaSO_4$ may remain in solution. The data are useful although they may not be accurately charted. Some laboratory work was done with brines containing barium and sulfate, Table 2, to show the effects of alkalinity and time on the amount of $BaSO_4$ remaining in solution.

Table 2—Analyses of Incompatible Brines, mg./l, in Osage County, Oklahoma.

	Arbuckle	Bartlesville
Na	50,642	51,435
Ca	11,130	10,170
Mg	2,014	2,038
SO_4	330	nil
Cl	103,355	102,865
HCO_3 ...	79	128
Ba	nil	866
Fe	52	126
Total solids ...	167,602	167,268
Sp. gr. at 60° F.	1.119	1.116
pH value	6.35	6.15

In the first experiment, two parts of the sulfate brine were added to one of the barium brine, yielding a solution with an excess of sulfate ion. The mixture was allowed to stand for 20 days at 72° F. and final pH was essentially unchanged at 6.2. It was found that 23 mg./l. of $BaSO_4$ remained in solution. This is in fair agreement with the data in Table 1.

The experiment was repeated except that pH was adjusted to 8.0 and standing time was only 48 hours. The change in pH, with less time for stabilization, left 77 milligrams per liter of $BaSO_4$ in solution.

In another experiment it was determined that slight precipitation was still taking place after 3 weeks at pH 7 and 72° F. Complete precipitation in a few hours requires a very low pH and boiling temperature. While these data will not permit any conclusions as to safe mixtures of waters under a wide range of conditions, a degree of tolerance is shown. And a harmless mixture of brines having small amounts of barium and sulfate might be used instead of being condemned on the mere presence of the compounds.

Brines shown in Table 2 caused thick deposits to form in a salt-water-disposal system, Figs. 1 and 2, where they were mixed on the surface before injection. The injection well and the formation were also plugged. These incompatible brines have since been injected into separate wells, about 400 yd. apart, but both using the Arbuckle limestone for disposal. Under these conditions no plugging of equipment or wells has occurred in the past 5 years.

At one water flood a barium water was used to flood the Aux Vases formation, which contained sulfate. No trouble was encountered until increase in produced brine necessitated its injection along with the supply water. Surface equipment became severely plugged in a short time and polyphosphate was successfully used as a scale preventive for remaining life of the flood. Formation plugging was not noted.

A number of examples of barium sulfate scale in producing wells have been noted where a sulfate water was used to flood a formation known to contain a brine containing barium. Formation plugging was strongly indicated in one well where a barium sulfate solvent[5] was used to bring about marked increase in produced fluids.

Calcium Sulfate

Calcium sulfate deposits may become troublesome when mixtures of waters or change in equilibrium conditions due to treatment cause the solubility of the salt to be exceeded. Available solubility data do not provide anything more than an educated guess as to the tendency of oil-field brines to deposit gypsum. Results of calculations in physical chemistry have been published[6] which indicate that the state of equilibrium regarding calcium sulfate may be accurately pre-

dicted. While these data add to our knowledge of the various salts in oilfield brines, they do not provide a dependable method of predicting precipitation of calcium sulfate. Some laboratory and field observations are given which illustrate outstanding examples of failure of the method.

A water flood near Meeker, Okla., used supply brine from a well completed in two or more zones of the Permian red beds. Analysis of the brine follows:

	mg. per liter
Na	46,007
Ca	6,900
Mg	1,900
SO_4	2,000
Cl	87,200
HCO_3	70
Total solids	144,077
Sp. gr. at 60° F.	1.104

This brine should not deposit gypsum according to calculations based on the method previously mentioned. These calculations indicate that in the order of 100 milliequivalents per liter (meq./l.) of $CaSO_4$ should remain in solution, whereas it actually has only about 42 milliequivalents per liter.

The supply brine was produced by deep well pump at a rate of approximately 3,000 bbl. per day. After 25 days' operation the well was pulled because of a broken shaft. It was found that the shaft had broken due to gypsum deposition. The deposit was about ⅛ in. thick on the outside of the tubing, below fluid level, and completely clogged the pump screen in places where it was a full inch in thickness, Fig. 3. The brine sample, after completing the analysis, was allowed to stand for further observation. At the end of 5 days, numerous small, needlelike crystals were found on the sides of the bottle and both calcium and sulfate had dropped slightly in accordance with the gypsum precipitation. Solubility curves, from literature data on $NaCl$-Na_2SO_4-$CaCl$ brines, indicated the supply brine to be dangerous from the standpoint of gypsum precipitation.

From the foregoing anomaly it would appear that all pertinent factors are not adequately treated in the calculation. Probably the chloride strength should be taken into account, as well as the effect of bicarbonate and pH value.

Although the composite solubility curves are a useful tool in cases of supersaturation of gypsum, they do not distinguish between dangerous and harmless mixtures when the tendency is in the critical area of a few milligrams per liter. Precipitation of even a few milligrams per liter from a large volume of water will cause trouble in time.

An example of this was observed in wells producing from the Cypress sand in Smith-Mills pool, Kentucky. Brine was stable when produced, as regards calcium sulfate, and no scaling was experienced on surface equipment. However, gypsum deposition in the well bore caused clogging of pull tube and greatly diminished flow of fluids from the formation face in a few months' time. Simple arithmetic shows that the precipitation of 5 milligrams per liter from 500 bbl. per day will produce 105 lb. of deposit in 120 days. This quantity of solid matter is more than sufficient to cause the trouble mentioned. Obviously, application of solubility curves and other calculations failed to predict this critical state of supersaturation.

An opposite and more fortunate condition is illustrated at a Cypress sand flood in Gallatin County, Illinois. Characteristics of the produced brine are shown in the analysis.

	mg. per liter
Na	18,957
Ca	1,651
Mg	346
SO_4	4,625
Cl	29,520
HCO_3	413
Total solids	55,512
Sp. gr. at 60° F.	1.042

The composite solubility charts suggest that this brine should deposit gypsum. On this basis, a chemical supplier recommended preventive treatment. Nevertheless, it was decided that in view of previous field experience with similar brines, no treatment would be used. No trouble from gypsum precipitation has occurred in 5 years of operation.

These examples show that the results of mixing and handling injection waters may be affected by slight tendencies not revealed by theory. It is not intended to imply that calculations of this nature are without value. Rather, they should be made as accurately as possible and tempered with field experience.

Calcium Carbonate

The tendency of water to deposit or dissolve calcium carbonate has been thoroughly investigated and described.[7,8] The data may be used to predict the tendency in fresh waters where conditions of temperature and agitation are known. Equilibrium constants used in the calculation are valid only to total solids content not much greater than 4,000 milligram per liter. However, this method of determining calcium carbonate stability has been applied to dilute brines, of 17,000 milligram per liter salt content, in Kansas fields.[9]

It is unfortunate that carbonate stability calculations are not exact in the common water-flood practice of mixing fresh supply water with produced brine. With fresh waters the relationship among alkalinity, calcium content, total dissolved solids, and temperature will predict reliably the possibility of carbonate scale formation. It will be seen that heat, agitation, and allowing escape of CO_2, are critical factors.

On the other hand, a fresh water which is stable may be added to a brine, in the absence of temperature rise or agitation open to the atmosphere, with resultant copious precipitation of carbonate. Contrary to some existing opinions, the occurrence of calcium carbonate scale on the interior of injection lines usually does not protect against corrosion. Instead this porous, discontinuous coating serves to localize and accelerate the attack.

Only one example of protective carbonate scale has been observed. This was a continuous, soft, and impervious layer on the walls of a pipe leading from a tank where the water had received lime-soda ash treatment. On the contrary, numerous examples are known where corrosion has occurred inside pipe having thick carbonate scale.

At one flood near Cromwell, Okla., the addition of fresh water to produced brine formed deposits of carbonate scale on injection lines. Although there were only 9 injection wells in the system, the corrosion holes reached a total of 28 per month before a change in supply water was made. As previously indicated, stability calculations did not predict this condition. In retrospect, it should be concluded that a large number of "supersaturation" tests would have indicated the tendency. Such investigation, followed by test nipples, would have confirmed the need for change far in advance of the costly proof of frequent corrosion failures. If such a situation exists, preventive treatment with sequestering agents is usually both efficient and economical.

Iron Sulfide and Iron Oxide

Deposits of iron sulfide and iron oxide may occur either as corrosion products or due to mixing of unlike waters, or a combination of these causes. It is agreed that mixing waters high in iron and sulfide prior to injection should be avoided. The ef-

fect of sulfide water on the permeability of a formation having appreciable iron in its water is receiving some attention. The amount of precipitation of iron sulfide is, of course, dependent on the amounts of sulfide and iron present in the waters and on the degree of mixing. A brine having 20 milligram per liter H_2S was injected into the Glenn sand, where interstitial water contained 50-80 milligram per liter iron, for a period of 1 year and no pressure buildup was noted. Thus it would appear that reasonable amounts of these compounds may be safely mingled in a reservoir if the initial permeability is good. Where the formation is sulfide-free and relatively tight, thorough tests on effect of sulfide water on permeability are needed.

Iron oxide deposits are easily recognized and similarly diagnosed as to origin. In the event the deposit is not due to corrosion and redeposition, it can only be due to contact of air with iron-containing water. This contact can occur through openings in equipment or by mixing oxygen-laden surface water with iron water in a closed system. The appearance of iron oxide stains or deposits should serve as a warning signal since either serious corrosion or plugging deposits is indicated. Permissible oxygen content varies with salinity[10] and these limits should not be exceeded with bare steel equipment.

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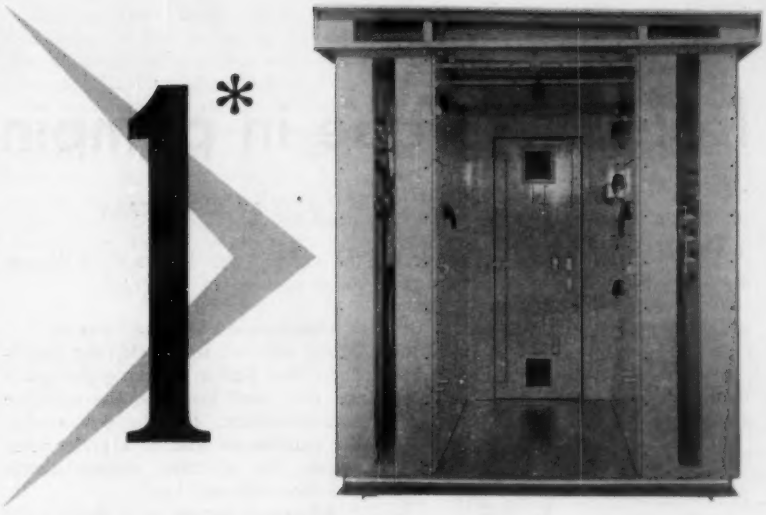

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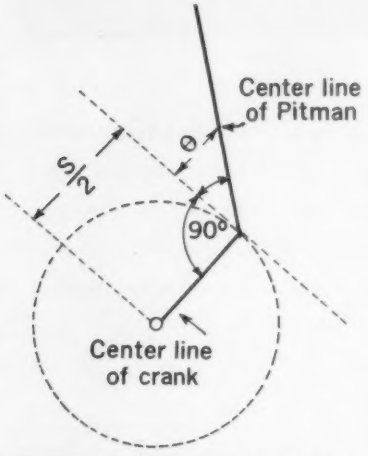
Role of torque in pumping problems

BY JOSEPH ZABA

AT THIS POINT of the series, dealing only with the basic, generalized sucker-rod pumping assembly, a simplified approach will be used to discuss the question of torque in the transmission portion of the unit. Pitman pull due to unbalanced well load creates the torque in the low-speed



TORQUE in the low-speed shaft of the speed reducer depends on the angular position of the crank. Fig. 16.

shaft of the speed reducer. Using the symbols of Fig. 16,

$$T = P \frac{S}{2} \cos \theta \qquad (1)$$

Where:
T = torque in inch-pounds
P = pitman pull in pounds

It is seen that the expression for T is a maximum twice during each revolution of the crank when the center line of the pitman is perpendicular to the center line of the crank. This occurs somewhere near the middle of the stroke, and the equation for the torque becomes:

$$T = P \frac{S}{2} \qquad (2)$$

Also, the expression is zero twice during each cycle when the center line of pitman intersects the center of the low-speed shaft. Between these two extremes, with the length of stroke a constant, torque is a function of the varying well load and of the angular position of the crank.

Unbalanced well load. For the upstroke part of the cycle, the unbalanced well load at a given point equals the total well load less the effective counterbalance. For the downstroke, the unbalanced load at a given point equals the effective counterbalance less the total well load.

Allowance torque of a shaft is the torque which the shaft is capable of transmitting continuously and safely. There exists, therefore, for any given reducer, a certain allowable torque which the reducer is capable of handling. Once selected, a given reducer determines the permissible loading conditions and the characteristics of the pumping cycle.

Since peak torque occurs twice during each revolution of the crank, the reducer must be designed for this peak torque. Peak well load is used to determine the unbalanced well load creating the torque. The formulas for the peak torque during the upstroke and downstroke may be then written:

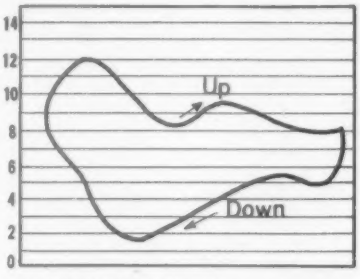
$$T_{U\,Max.} = (W_{Max.} - C) \frac{S}{2} \qquad (3)$$

$$T_{D\,Max.} = (C - W_{Min.}) \frac{S}{2} \qquad (4)$$

Where:
$T_{U\,Max.}$ = peak torque during upstroke, in.-lb.
$T_{D\,Max.}$ = peak torque during downstroke, in.-lb.
$W_{Max.}$ = maximum well load, lb.
$W_{Min.}$ = minimum well load, lb.
C = effective counterbalance, lb.
S = stroke, in.

Equations 3 and 4 suggest that the possibility of reducer overload exists during both the up and the downstroke parts of the cycle. In other words, with a given reducer, conditions may occur under which a combination of maximum well load and counterbalance on the upstroke or counterbalance and minimum well load on the downstroke result in a torque which is larger than the allowable torque of the reducer.

Crank position. Second factor affecting torque within the pumping cycle is the angular position of the crank. As stated, peak well load is used in determining the peak torque. Actually, using the peak load with the longest possible arm (center line of pitman perpendicular to center line of crank) would be justified only if peak load were occurring somewhere along the middle of the stroke. This, however, is not always the case. For instance, in the case of the dynamometer card shown in Fig. 17, peak



DYNAMOMETER CARD from a pumping unit where the peak load occurs at the beginning of the stroke. Fig. 17.

load occurs at the beginning of the stroke.

Because of the angular position of the crank at this point, this peak well load would have nothing to do with the torque occurring at the longest arm of leverage. However, the relationship in Equation 2 is justified by a need for the factor of safety due to a number of other conditions.

Length of stroke. Use of peak well load in calculating peak torque introduces the question of production and speed of operation.[1] Both formulas for peak polished-rod load contain the product of stroke and speed of operation. For any given size of the pump plunger, this represents the pump's displacement and the obtainable production. As far as torque is concerned, a short stroke is desirable. However, if production is to remain constant for a fixed plunger size, shortening the stroke must be offset by increased speed of operation.

Considering torque alone, a fast short-stroke cycle is therefore desirable. However, characteristics of the pumping cycle are governed also by other things. Among them are effect

of speed on rods with increasing well depth, effect of speed, and length of stroke on performance of the pump and the individual well and pumped fluid characteristics.

Other considerations. Calculating torque for new installations or analyzing torque conditions of an existing installation is more complex than shown in this basic discussion. For instance, disregarding effects of geometry of the unit may lead to serious errors. In analysis of torque conditions during the cycle, two torques are considered. One is due to well load less beam weight balance, if one is used, less the "beam off-balance." The other is due to rotary weights. The resulting net torque is the one of interest. The "beam off-balance" results from the fact that, structurally, the assembly of horsehead, beam, and pitman is usually heavier at the pitman end. In some cases this force cannot be disregarded. These, and other considerations, will be introduced later in the appropriate portions of the series.

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Chemical cleaning poses corrosion problems

. . . Here's how to cope with them

BY CHARLES M. LOUCKS, PH. D.
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A PROBLEM in the field application of chemical cleaning is anticipating and controlling potentially serious corrosion.

The acid solvents have corrosion properties which can be evaluated in the laboratory. But in the field, the presence of undissolved deposit phases and dissolved reaction products in the acid solvent may alter the corrosion problem.

Primarily the problem of corrosion control exists where cleaning is done with strong mineral acids. Also, there are the economic, company policy, and human aspects of the problem.

Selling Chemical Cleaning

One of the more serious deterrents to chemical cleaning initially was user concern about corrosion properties of mineral acids, even though inhibited.

An important part of the sales story was to convince a potential user of the safety afforded by the inhibitors. Laboratory corrosion data were an important part of the story. Field experience confirmed that inhibited acid (hydrochloric acid) could be handled with relative safety and it did become a useful maintenance tool.

There were occasional unfortunate experiences and the service company engineer frequently found himself on the defensive. But, in fairness to him, we must agree that he and his inhibited acid got the blame for much corrosion they disclosed but did not cause.

It was learned that there was much more to the corrosion problem than reciting laboratory data obtained by exposing carefully selected metal specimens to inhibited acid solution in control laboratory tests.

Presented at refining-industry symposium NACE, Dallas.

Inhibitors

The steel industry gave considerable attention to acid pickling techniques and by 1920 the use of inhibitors was becoming generally known. In 1928, Chappell, Roetheli, and McCarthy[1] of MIT said "The use of inhibitors has long been known in industry and in recent years very powerful ones have appeared on the market." In 1927, Speller and Chappell gave a paper titled "Inhibitors—Their Behavior in Laboratory and Plant."[2]

Also, in 1928, Speller, Chappell, and Russell, reported chemical cleaning with inhibited acid the cold-water piping in the 35-story Bankers Trust building.[3] The report describes the careful planning and emphasizes the necessity for competent supervision.

Scientists continued work on the properties and mechanisms of inhibitors in several laboratories. Several reports are available: Mann and Ch'iao[4], Breid and Winn[5], Heckerman[6,7], and Nathan.[8,9]

People more directly concerned with the chemical cleaning service ran tests and wrote reports about the behavior of inhibited acids on ferrous and nonferrous alloys.[10,11,12,13,14,15] There were observations about the effect of composition, crystal structure, stresses, etc.

Laboratory and Field Experience

Questions arose about the effect of hydrogen in steel during and after the use of inhibited acids and is discussed by Darken and Smith.[16]

Sometimes the phenomenon of crevice or contact corrosion became involved in chemical-cleaning operations. The general aspects of crevice corrosion were explored by LaQue and coworkers.[17,18] Though their experimental observations involved sea water rather than acids, the basic concepts apply.

There were contributions to the chemistry of the reactions involved in chemical cleaning and the effect of reaction products on the corrosion rates. Some of the contributors were: Alquist[19]; Alquist, Wasco, and Robinson[20]; Gatos[21]; Buck and Leidheiser[22]; and others.

"Ferric Iron Corrosion" became a common expression. There was little argument about the qualitative explanation but the "quantity" of harm remained obscure and not much was done about it.

The chemistry of copper and its compounds was also fairly well known. When leaves and sheets of redeposited copper remained in utility boilers after chemical cleaning and caused subsequent tube failures, something had to be done.[23]

In refinery equipment, everyone is conscious of the redeposition of metallic copper during chemical cleaning, but there has been no feeling of urgency to spend money to do anything about it.

When hydrogen sulfide is a reaction product, it may adversely affect corrosion rates. Walston and Dravenieks[24] report some observations.

Hazards. Less well understood is localized corrosion, which may be induced by undissolved solid phases during and after chemical cleaning. It is easily demonstrated that mill scale is cathodic to steel in the presence of an electrolyte.[25,26,27] Other solid phases, including iron sulfides[24] and redeposited copper may be found to do the same.

Also, deposit phases left undissolved may merely remain as piles of debris. The piles may defy rinsing

and neutralizing and may remain soaked with acid solvent or other strong electrolyte. If such debris is not properly removed, it may become a serious cause of corrosion.

Other papers on chemical cleaning list other potential hazards.[24 28 29]

Every discussion of chemical-cleaning techniques mentions hydrogen gas as one of the reaction-product hazards because of the possibility of explosive hydrogen-air mixtures. This hazard is rather easily controlled. Yet, one finds the article headlined "Hydrogen Bomb in Your Plant."[30]

The reaction product, hydrogen sulfide, is well known to be extremely hazardous. Again, it can be handled with reasonable safety by good engineering; yet, several people have lost their lives and a number of near-fatal incidents have occurred.

Successes. But on the more positive side are many reports, including the one by Speller, Chappell, and Russell,[3] of successful performance and savings in time and money. Examples of headlines are: Acidizing Cuts Costs,[31] Chemical Cleaning Makes Money,[32] Boiler Scale Removed by Chemical Cleaning,[33] Chemical Circulation Methods in Cleaning and Descaling Petroleum - Processing Equipment,[34] Oil Crude Line Gets Cleaning,[35] and Chemical Cleaning Is Cheaper, Too.[36]

Conclusion

Chemical cleaning is here to stay and it can become a vastly more useful maintenance tool in your plants. If chemical cleaning can save time and money in plant maintenance, management will be motivated to explore further uses.

The service contractors have served and will continue to serve a useful purpose. Their stock in trade has been essentially inhibited muriatic acid and it will continue as the cheapest and most reactive acid solvent for dissolving inorganic scale and corrosion products.

Many chemical materials other than muriatic acid have potential use in maintenance work and with less corrosion hazard. Most of them cost more per pound. Examples are: citric acid,[37] sulfamic acid,[38] and chelating agents.[39] These and many other materials offer interesting chemical properties and maintenance possibilities.

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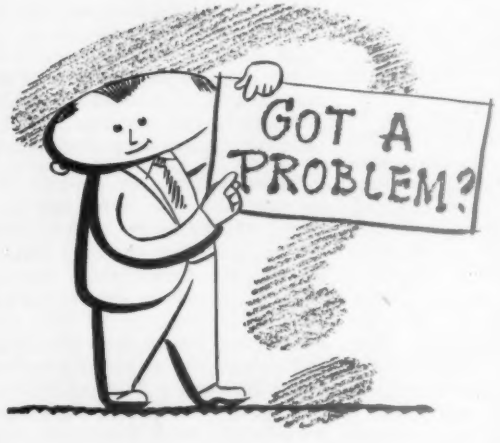

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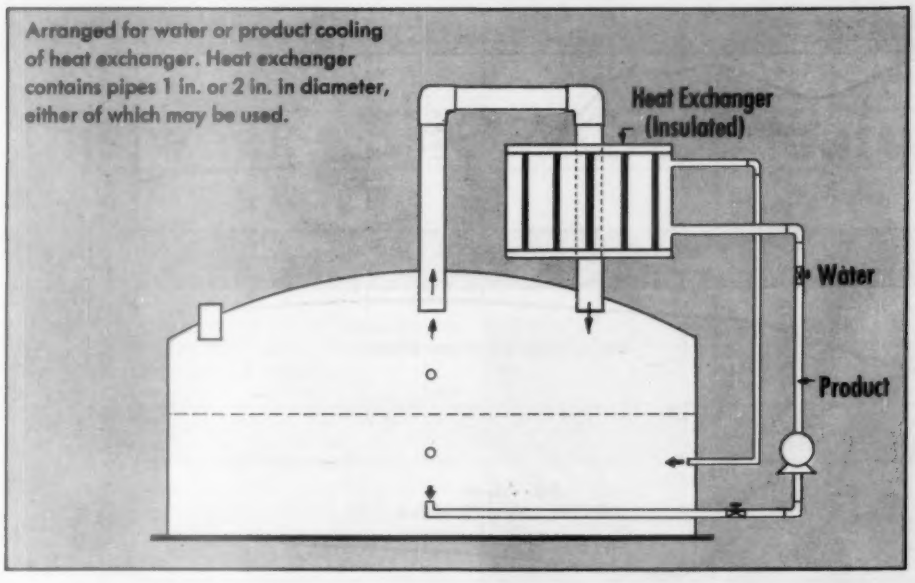

Arranged for water or product cooling of heat exchanger. Heat exchanger contains pipes 1 in. or 2 in. in diameter, either of which may be used.
Heat Exchanger (Insulated)
Water
Product

VAPORS and heated air are passed through exchanger where they are cooled and returned to vapor space. Circulation is automatic. Fig. 1.

SUMMARY of results from a number of runs. Rate at which pressure is reduced apparently is a function of the temperature difference between the cooling medium and the warm air and vapors. Fig. 2.

• Floating roofs, expansion roofs, and pressure tanks are improvements in the drive to cut product losses. But what about the many cone-roof tanks still in use? Recent studies on pilot-scale equipment show a new way to . . .

Cut evaporation losses from storage tanks

BY C. A. BASORE
Head, Department of Chemical Engineering, Auburn University
Auburn, Ala.

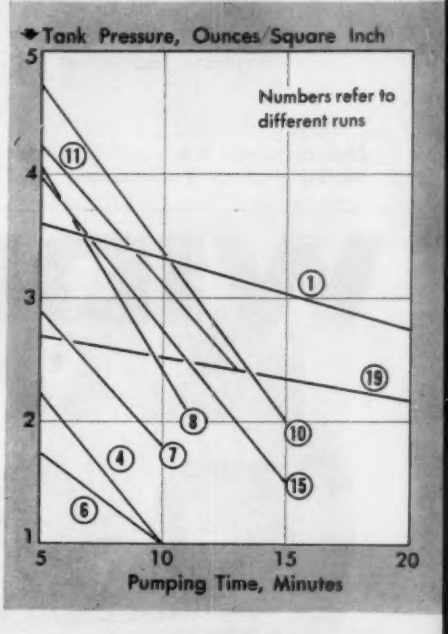
HERE'S HOW the process operates: as the tank pressure increases because of heat, a small portion of the heated air and vapors is discharged from the top. This is circulated through an external but adjacent heat exchanger. Cooled air and vapors are then returned to the top of the vapor space.

Circulation is automatic. It apparently depends upon rate of heating and upon the fact that the tank is heated unequally. Should rate of heating and the resulting tank pressure increase, the volume of air and vapor which is recycled also is increased. This in turn increases the forces working to reduce the pressure.

Why the loss? Most of the pressure developed in storage tanks by solar heat is believed to be caused by unequal heating. Part of the liquid, particularly that near the sides, is evaporated. Resulting vapors plus the air are superheated.

These conditions produce sufficient pressure to open the automatic relief valve, allowing some of the vapors and air to escape. This continues until tank pressure is reduced to the setting of the valve. The escape of some of the vapors reduces the pressure over the liquid in the tank, allowing more to be evaporated. Again pressure increases, which causes the relief valve to open for the second time. This continues throughout the day. Obviously there is no resistance whatever to evaporation.

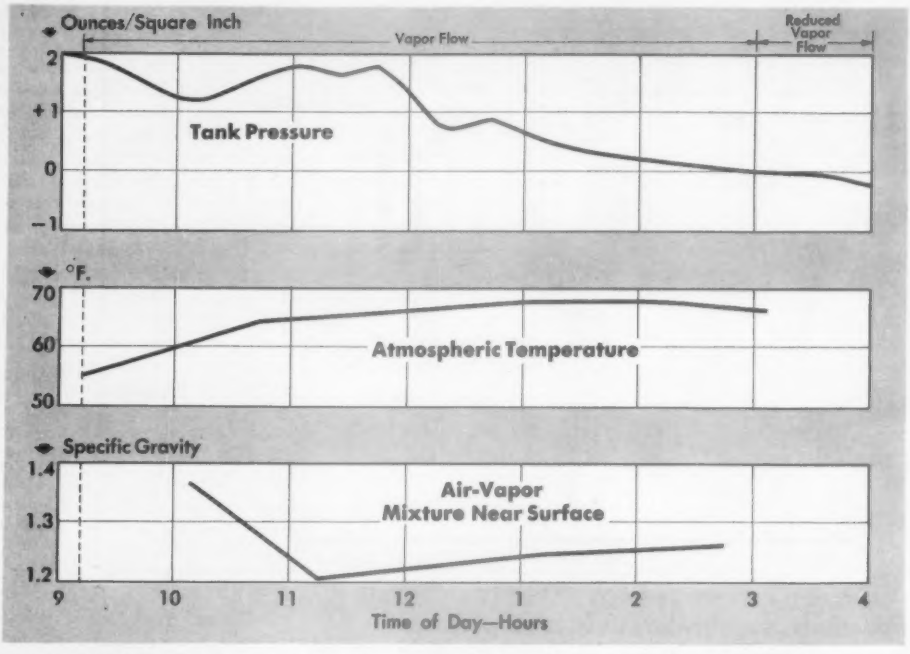
While the increase in pressure to be expected at the maximum temperature to which storage tanks are exposed is only moderate, it exceeds the operating pressure of cone-roof tanks. However, the pressure can be reduced below structural limits by this simple method.



Pilot-Scale Results

Based upon a relatively large number of successful small-scale experiments, a series of pilot-plant tests was designed to determine the pressure developed where a small tank containing a volatile petroleum product was heated unevenly (i.e. by solar heat). These tests with the exception of the first few were carried out by Graver Tank & Mfg. Co.

A heavily constructed tank, 10½ ft. in diameter and 8 ft. high, was about half-filled with a 10.5-R.v.p. gasoline. The tank was closed and by exposure to solar heat the pressure was allowed to build up to 6-8 oz. of water (Fig. 1).



TYPICAL PILOT-PLANT run shows the effect of circulating vapors through the exchanger. Fig. 3.

To begin the test the valve to the heat exchanger was opened, and the cooling medium was circulated by a pump (hand-operated) through the heat exchanger. The rate at which the pressure was reduced was recorded.

Fig. 3 shows results of typical run. The upper curve shows the rapid decline in tank pressure when the cooling medium was circulated.

The second curve shows that atmospheric temperature (and presumably tank temperature) was increasing during most of this period.

The lower curve is of particular interest. Specific gravity of the air-vapor mixture near the liquid surface declined for about 45 minutes after beginning the run. Then it increased steadily. During this period tank pressure was declining.

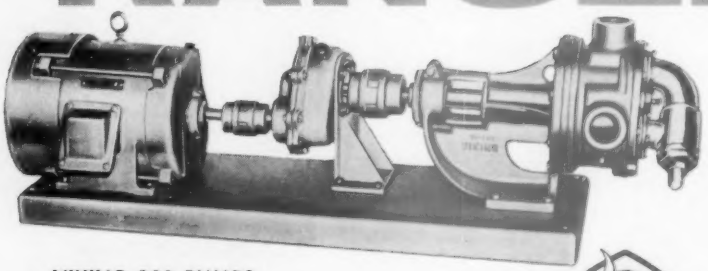
The curve shows that, during application of this process, molecules of the cooled vapors are concentrated above the interface. Here they are obviously in a position to condense or to be absorbed by the liquid. Both of these effects would reduce the pressure.

Fig. 2 summarizes results from a number of runs. Only average slopes of the pressure curves are plotted.

Acknowledgment

This article is a result of studies conducted under a fellowship established at Auburn University by the Graver Tank & Manufacturing Co., and conducted by the chemical engineering department through the Auburn Research Foundation. Special thanks are due William L. Barham, research fellow, and R. W. Bodley of Graver. A patent has been applied for on this process, and rights have been assigned to Graver.

WIDE RANGE!



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This Viking 288 unit features the independently mounted gear reducer, which accepts any one of 5 helical gear reductions in the same case. Motor, pump and couplings can be changed quickly, too.

For handling gasoline to lube oil, these units are the last word in smooth, quiet, positive self-priming operation. Long-lasting, heavy-duty construction means years and years of top service.

For complete information on Viking 288 Pumps, plus the complete line of Viking petroleum pumps, ask for catalog GT.

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This week's SHOWCASE features . . .

Hoe attachment lets you pick boom length

. . . and gives 13 ft. of variation on a ¾-yard hoe. Maximum boom length is 23 ft.; minimum is 10 ft.

Advantages claimed over other models by the maker are that line and grade can be better maintained; footings can be more accurately dug with the same machine; trenching in restricted areas and around service lines is facilitated; and dirt can be moved farther from the excavation.

The Burg Super hoe is adaptable to any type of digging job. The variable-length boom promises to increase job efficiency as you can maintain work cycle speed while having to move the unit fewer times. Source: **Burg Mfg. Co., Waverly, Neb.**

Motor-starter housing

. . . of aluminum, just announced is an explosionproof, manual type equipped with mounting lugs for convenient installation and a large screw type of cover for easy access.

A set screw on the cover maintains proper alignment of the control buttons with the starter motor, according to the maker. The front-operated Series GMMS housing is suitable for custom hub arrangements, the maker says. Source: **Killark Electric Mfg. Co., 3940 Easton Ave., St. Louis 13, Mo.**

●

Temperature-indicating

. . . materials now being marketed, can be used in any industrial or commercial application where temperature, and its correct determination, are factors. Thermocron crayons and DetectoTemp paints indicate the temperature of hot surfaces by distinct changes in color.

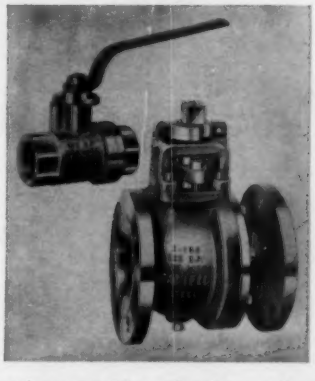
Eighteen crayons provide temperature measurements from 150° to 1,240° F. Thirty-six paints cover a range from 104° to 2,462° F. Thirteen of the 36 paints undergo multiple color changes at different temperature levels.

The crayons can be obtained in a complete assortment of 18 crayons with holder, or in a package of six crayons. The paints are available in 4-ounce or 1-lb. cans. Source: **Air Reduction Sales Co., 150 E. 42nd St., New York 17.**

●

Valve body

. . . made in nine alloys has been announced. These body materials are cast iron, ductile iron, bronze, aluminum, carbon steel, Types 316 and 304 stainless steel, Alloy 20, and Monel. The new ball valve is designed for use at pressures up to 1,000 psig. and temperatures up to 400° F. It can be used with steam, gases, oil,



abrasive media, slurries, and corrosives, the maker reports.

One feature of the ball valve is that only a quarter turn is needed to open it. Solid teflon packing is used. Packing adjustments can be made easily

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Described in OIL AND GAS JOURNAL · Issue of **August 8, 1960**

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in the field, the maker reports. Ball-seal compression can be adjusted to compensate for excessive wear, cold flow, or compression set.

The valve comes with screwed ends in sizes from ¼ to 2 in. and with flanged ends in sizes from ½ to 10 in. Pressure ratings range from vacuum to 1,000 psi. Temperature ratings range from −459° to 400° F. Seat materials may be Buna-N, Neoprene, Viton, Kel-F, or Teflon. Source: **Pacific Valves, Inc., 3201 Walnut Ave., Long Beach, Calif.**

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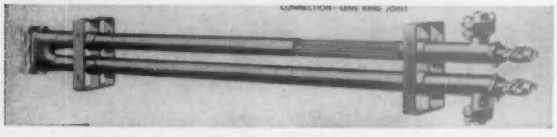
Double-pipe heat exchanger



. . . lately developed is so constructed that the tubeside connection and the tubeside closure require only two ¾-in. alloy-steel studs each, which promises to reduce the cost of the exchangers over conventional double-pipe units requiring a complex bolting arrangement. Economies are said to be further obtained by a simplified hammer lug design which locks the head-to-tube closure into place by means of one large, forged, hammer type of nut.

The hammer ring is easily accessible from the front end which makes the unit relatively easy to disassemble.

The tube element can be pulled straight from the shell. Shell nozzles are integral with the shell, which prevents misalignment. A metal sealing-ring closure is incorporated between the tube and shell to give an accurate closure.

The makers standard 3-in., low-pressure heat exchanger is made with fin tubes suitable for design pressures of 5 to 600 psig. Types are also available for higher pressures. Fin-tube materials available include carbon steel, stainless steels, nickel, monel, and chrome-moly alloys. Bimetal construction is also available. Source: **Brown Fintube Co., 300 Huron, Elyria, Ohio.**

CM2-RC

CMI-BK

MACCO

TIME TESTED PRODUCTION EQUIPMENT

MACCO RETRIEVABLE CM2-RC INTERMITTING OR CONTINUOUS FLOW VALVE

The CM2-RC is the basic CM2 conventional valve with integral reverse flow check valve. This valve is selectively retrievable from MM series Sidepocket Mandrels. For continuous flow operations, graduated port sizes of valve seats govern gas passage of the valves.

For further information, write for Retrievable Valve Brochure No. 9-01.

MACCO RETRIEVABLE CM1-BK INTERMITTING OR CONTINUOUS FLOW VALVE

The CM1-BK is the basic CM1 conventional valve with integral reverse flow check valve. This is selectively retrievable from K-B and K-C series Sidepocket Mandrels. The CM1-BK valve was designed with particular emphasis on "slim hole" installations. Continuous flow valves are equipped with graduated port sizes as required.

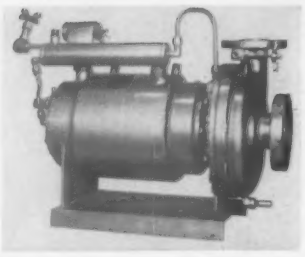
For further information, write for Retrievable Valve Brochure No. 9-01.

MACCO equipment is also available in sterling areas from Williams & James (Oil Tools) Ltd., Gloucester, England.

MACCO OIL TOOL COMPANY, INC.

1521 Prince P. O. Box 7288 Houston 8, Texas

Phone UN 1-1253



Canned pump

. . . with heat exchanger externally mounted is designed for high-temperature operation. The pump is also equipped with water-cooling jackets around the motor section for added cooling.

The pump and motor are one unit. A portion of the pumped fluid circulates through the motor section between the rotor and stator. Pumped fluid serves as both motor coolant and bearing lubricant. Source: **Chempump Div., Fostoria Corp., Huntington Valley, Pa.**

•

Valve offers three

. . . choices of body materials, aluminum, aluminum - bronze, and ductile iron. The Norriseal wafer type of butterfly valve is designed for working pressures to 150 psi. The aluminum and aluminum-bronze bodies with double-rib type (tangency) design were developed to prevent the collapsing of flanges.

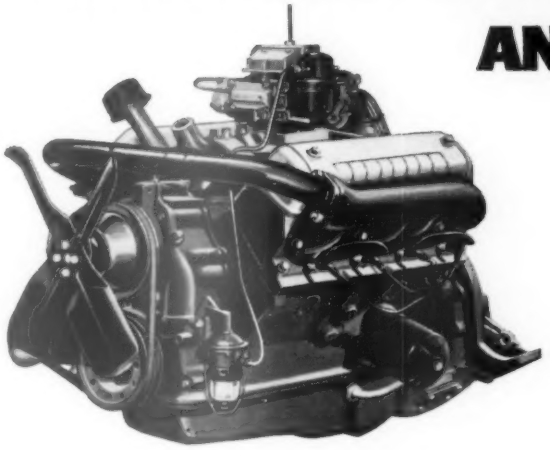
The ductile iron body has a lug type of design and may be drilled or tapped as desired. All three valve bodies are available in sizes from 2 to 12 in. Source: **W. C. Norris, Manufacturer, Box 1739, Tulsa.**

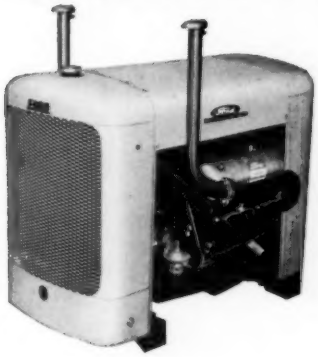
•

Help for water draw-off

. . . from tanks is this J&J valve with two seats or valves mounted on the same stem. The inner valve seats first which permits the chamber between the inner and outer valves to drain before the outer valve is closed. The inner valve is located well inside the tank, insulated by the air chamber between the inner and outer valve, and surrounded by tank products, consequently, under normal conditions, it is nonfreezing.

Announcing the rugged FORD 292 V-8 INDUSTRIAL ENGINE AND POWER UNIT!





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Customers' orders flowing through Columbia-Southern's Order and Service Department, directed by Paul McHail, are routed without delay to the appropriate shipping point by means of a modern, direct communications network. During their brief passage through the Department, they are checked against customers' standing specifications and given complete routing instructions by representatives of the Traffic Department. The central location of Order and Service at Columbia-Southern's Pittsburgh Headquarters provides close contact with product managers and others, making fast decisions an everyday reality.

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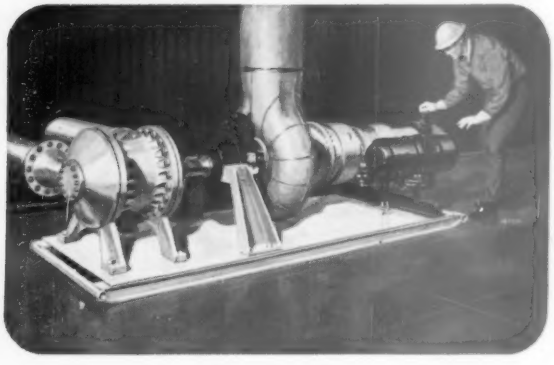
Petroleum industry benefits with Solar turbomachinery

1. Easily transported

Because they are smaller and lighter than conventional power plants, Solar gas turbines are easily transported for original installation, or to a central shop for periodic maintenance. And the basic power plants, or generator sets, compressor units, and similar applications, can be inexpensively adapted for portable use.

2. Low cost installation

The same light weight and small size that makes transportation simple, also cuts the cost of installing Solar gas turbines and turbomachinery. Minimum vibration makes possible skid mounting or the use of present light foundations — you avoid heavy construction costs and install these units quickly without special labor requirements.



3. Simple maintenance

Solar gas turbines are simple in design, with few moving parts. They are easier to maintain than diesel or gasoline engines. Down time is cut to a minimum. Features such as interchangeable compressor wheels in Solar compressor units make quick field changes possible. Solar turbomachinery is designed for long, trouble-free life.

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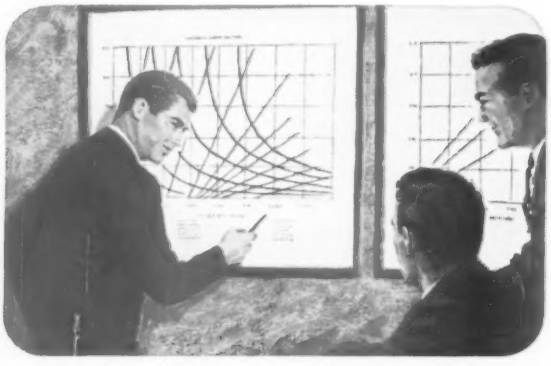

4. Low over-all cost

Whether you consider the capital cost of installed horsepower, or operating and service costs per installed horsepower, you will be pleasantly surprised when you measure Solar gas turbines against competing installations. We'll furnish the facts and figures you need on request. Solar builds turbines and turbomachinery to rugged industrial standards, for electrical power generation, gas compression, pumping, boat and vehicle propulsion, and for many special applications. Solar gas turbines range in size from 50 to 1250 hp.

You should investigate the profitable use of Solar gas turbines and turbomachinery. Write to Solar Aircraft Company, Dept. H-146, San Diego 12, Calif., for brochures or for information about specific applications.

The valve permits the operator to push on the handle with the inner valve closed and the outer valve open to flush off the seat of the inner valve any foreign particles that might cause leakage. The valve comes in four sizes for threaded or flanged tank mounting. Source: **Johnston & Jennings Co., 4700 W. Division St., Chicago 51.**

•

Flow switch

. . . recently disclosed, is operated by a vane. The Model V-4 Flotect switch is an explosionproof, high-pressure, magnetically actuated type. The body is one piece to prevent leaks. Working pressure is 2,000 psi. and the electrical rating is 5 amp. at 125/250 volts a.c.

The switch installs in the main product line and responds only to product flow, according to the manufacturer. The contact arrangement is a single-pole double-throw type. Mounting threads are 1½ in. N. P. T. The electrical assembly can be removed for inspection without shutting down pipeline operation. Actuation and release rates are varied by the shape and size of the vane. Source: **W. E. Anderson, Inc., 320 W. 80th, Kansas City 14, Mo.**

•

New motor

. . . in ratings to 2,000 hp. is available in standard enclosed construction for use in nonhazardous locations and in explosionproof construction for hazardous locations Class 1, Group D. The motor is a tube-cooled, air-to-air, heat-exchanger type designed to operate in unfavorable environmental conditions.

Applications include pumps, compressors, fans, and blowers. Features include corrosion-resistant construction, capsule type of split-sleeve bearings, and pressure lubricating system with oil-level indicators. Source: **Louis Allis Co., Lou & Skid Sts., Milwaukee 1, Wis.**

•

Industrial TV camera

. . . moves easily from one location to the other. The Type TE-9-A closed-circuit TV camera is a self-contained, single-unit transistorized type designed to function at high efficiency under extreme conditions of vibration and noise. Enclosed in a dust-tight housing, the Vidicon unit is cylindrical in design, measures 11¾ in. long and 5½ in. in diameter, and weighs 9 lb. Source: **General Electric Co., Schenectady, N. Y.**

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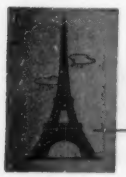

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SHOWCASE . . .

New Literature

Porcelain for Process Industries

. . . is the title of a new 26-page catalog which defines chemical porcelain, describes how it is manufactured, and explains its properties and possibilities.

Photographs, schematic drawings, and application pictures explain such products as unarmored valves, pipes, fittings, Tufclad (armored) porcelain valves, Y and angle valves, stuffing-box details, check valves, safety valves, plug cocks, pipes and fittings, reducers, swivel flanges, Raschig rings, porcelain towers, tower plates, special ceramics, and custom-made porcelains. Source: **Process Equipment Div., Lapp Insulator Co., 117 Hall St., LeRoy, N. Y.**

Power-converter

. . . principles and basic uses of the Add-A-Phase converter are covered in a series of new brochures, yours upon request. The unit is a static converter capable of producing symmetrical 3-phase 220 or 440-volt power from a 220-volt single-phase source. Source: **Add-A-Phase Div., System Analyzer Corp., Nokomis, Ill.**

How to Clean Chemical Equipment

. . . is told in a booklet that simplifies the diagnosis and suggests treatments. The 16-page illustrated booklet lists soils frequently found on chemical-processing equipment surfaces, and describes solutions and procedures which have proved efficient in removing these soils under actual field conditions. Source: **Oakite Products, Inc., 159 Rector St., New York 6, N. Y.**

Digital information

. . . system which uses all solid-state components (the Metrotype system) is described and illustrated in new 8-page Bulletin E72-2. Complete specifications are listed along with a variety of readout devices. Source: **Bailey Meter Co., 1050 Ivanhoe Rd., Cleveland 10.**

Processing problems

. . . are solved through continuous, automatic, and accurate measurements and controls provided by nuclear den-

sity gages, as described in a series of newly published data sheets. The literature pieces cover such applications as coke drum level measurement, specific gravity measurement in product pipelines, level measurement of propane, and sulfuric acid-hydrocarbon density measurement. Source: **Ohmart Corp., 2236 Bogen St., Cincinnati 22.**

Drilling-mud additive

. . . and emulsifying agent, called Seeco-Mul, is detailed in new technical Bulletin S 1. It discusses lubrication characteristics of drilling-mud fluids, with special emphasis on extreme-pressure lubricating properties of mud additives.

Also covered are low-surface-tension, low-yield-point drilling fluids, including the advantages of larger-sized cuttings, lower mud-solids content, minimized water blocking of pay sands, fluid-friction losses, etc. Source: **Crossett Chemical Co., P. O. Box 271, Crossett, Ark.**

Procedures are given

. . . for using the Barnes Layer method to determine an exact inventory of subsurface soils by quantity, quality, and location. According to Manual E-63, the method utilizes conductance of the earth, as measured by a portable electrical instrument, the Model 274 M Michimho - Vibrotester, weighing only 20 lb. Source: **Associated Research, Inc., 3777 W. Belmont Ave., Chicago 18.**

Cryogenic-gas data

. . . available printed on two new cards—one, a wallet-size; the other, an 8½ by 11-in. card—each containing the same information. Data supplied includes boiling points, critical points, triple points, specific heats, and densities of 34 different gases ranging from acetylene to xenon. Source: **Air Products, Inc., Allentown, Pa.**

Replacement air filter

. . . Bulletin B tells how the ULOK cube-type filter can reduce bank-face area by more than half. It describes the physical process of reverse loading, responsible for the filter's efficiency and life span. A diagram illustrates typical arrangements, and a data table lists the capacity and resistance of each of 12 filter sizes. Source: **Union Carbide Development Co., 30 E. 42nd St., New York 17, N. Y.**

KAISER LO-ERODE: HIGHEST RESISTANCE TO EROSION IN CYCLONES—TO 2400°F

Kaiser Lo-Erode high-purity, low-iron castable refractory is especially designed to resist the severe abrasive forces in refinery cyclones, lines, elbows, standpipes, and sugar-scoops.

It gives you the most effective, most economical abrasion resistance available in a refractory today.

In Lo-Erode, an extremely dense and hard aggregate is combined with a special binder. The result is superior strength and excellent erosion resistance within the service temperature range of catalytic units. Lo-Erode is ideal for use where highly abrasive particles or fluid solids are being handled at accelerated velocities.

For full details and installation procedures, call or write Kaiser Refractories & Chemicals Division, Kaiser Aluminum & Chemical Sales, Inc. at any of the Division Offices listed below:

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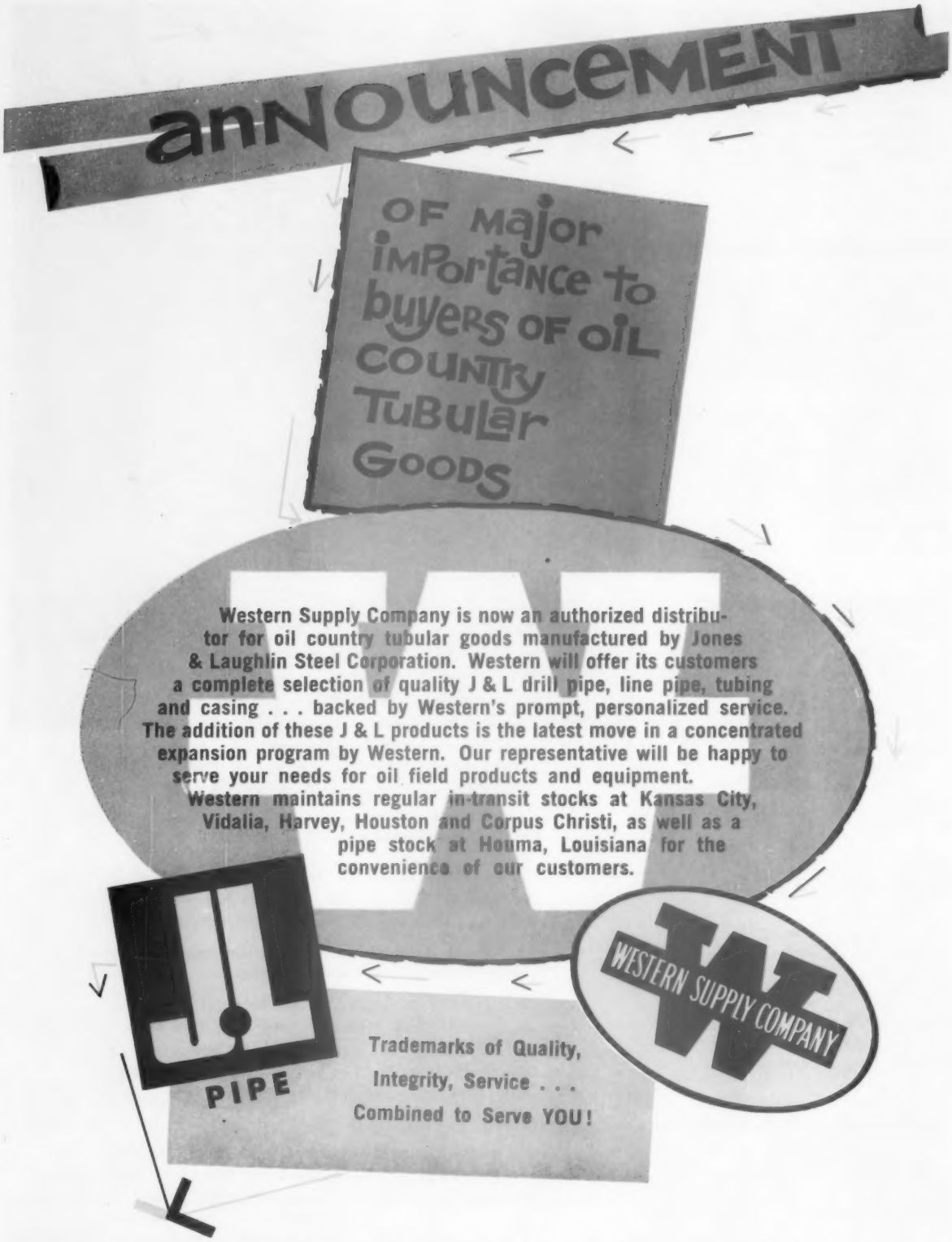
announcement
of major importance to buyers of oil country tubular goods
Western Supply Company is now an authorized distributor for oil country tubular goods manufactured by Jones & Laughlin Steel Corporation. Western will offer its customers a complete selection of quality J & L drill pipe, line pipe, tubing and casing . . . backed by Western's prompt, personalized service. The addition of these J & L products is the latest move in a concentrated expansion program by Western. Our representative will be happy to serve your needs for oil field products and equipment.
Western maintains regular in-transit stocks at Kansas City, Vidalia, Harvey, Houston and Corpus Christi, as well as a pipe stock at Houma, Louisiana for the convenience of our customers.
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▶▶▶ Equipment Men Notes

Security Engineering appoints

. . . K. L. (Ken) Byerly as vice president of domestic sales, and John G. Orton as vice president, export.

Byerly joined Security from another Dresser affiliate, Magcobar de Venezuela, where he was vice president and general manager. His association with Magnet Cove Barium Corp. dates back to 1948 when he was field engineer in the Louisiana-Arkansas territory. Byerly also organized and developed Texoma Mud Co., a Magcobar distributorship in Sherman, Tex. Earlier he was with Cities Service Refining Corp. for 5 years.

K. L. Byerly

J. G. Orton

Orton went to Security after 9 years with Reed Roller Bit Co. as division sales manager in Venezuela, Peru, Ecuador, Colombia, and the West Indies, and as sales division manager of the Eastern Hemisphere in London.

Odex Engineering Co. opens

. . . a new division office in Oklahoma City to house sales and shop facilities for the Oklahoma, Kansas, and northern Texas area. It will provide for turnkey installations, repairs, and service on Odex's lease automation equipment. Personnel assigned are: Tom Sherrill, division manager; Perry West, shop superintendent; and Don Gaston, sales engineer.

ANNUAL MANAGEMENT MEETING has just been completed by BJ Service, Inc., in Fort Worth. During the sessions company executives formed operating plans for the next 12 months. Present were, from left, standing: L. H. Kaltenberger, B. L. Crone, R. H. Jackson, C. W. Ludwig, C. C. B. Moody, J. T. Streger, J. L. Replogle, M. B. Riordan, Al Graff, J. L. Buster, and A. M. Birnie. Seated, from left, are: W. T. Box, John B. Merritt, C. Z. Hughes, C. L. Sorrentino, C. R. Cross, R. P. Maddox, A. T. Jones, J. C. Jackson, and C. F. McMahan.

Fisher Governor Co. prepares

. . . a new sound and color strip film for the natural-gas industry, covering essential elements of gas regulators.

The film, complete with cartoons and diagrams, may be projected either manually or automatically. It fits a standard 35 mm. strip film projector with 33⅓ r.p.m. record player. Presented in two parts, running time is about 30 minutes.

The film is available for industry educational meetings through Fisher territory sales representatives or directly from Fisher Governor Co., Marshalltown, Iowa.

Clayton Mark & Co. promotes

W. J. Dickman

. . . William J. Dickman to assistant sales manager of its Union Division, according to Clarence Mark, Jr., executive vice president. Dickman, a company member since 1945, has been a district sales manager in the division for the past several years.

W. B. (Bill) Brown becomes

. . . sales manager of the products branch of the Dow Chemical Co.'s Dow Industrial Service Division. A product manager at Dow's Midland, Mich., headquarters, he will transfer to the Cleveland location of DIS to assume his new duties September 6.

In his new position, Brown will be responsible for organizing the field sales group and developing full sales potential for the product branch. He joined Dow in 1954 in technical service and development at Midland. He was transferred to alkali sales as a technical salesman later that year, became a regional coordinator in 1957, and was promoted to product manager in 1959.

GUESTS in attendance at the recent Houston Chapter of Nomads meeting were, front row, from left: Jack Howland, Mene Grande Oil Co., Venezuela; Fred Schnars, Camco, Inc., Mexico; Jim Bridges, Jim Bridges Co., Mexico; Jacques Fouchet, French Consulate, Houston; G. W. Berry, A-Z Export Co., Venezuela; and Tom Hall, General Geophysical Co., Houston (speaker of the evening). In the back row are, from left: David Wood, Houston Oil Field Material Co., formerly of Mobil Oil, Germany; Herbert Kuerzl, Mobil Oil Co., Germany; Robert Ray, National Tank Co., Venezuela; and A. J. Organ, Reed Roller Bit Co., Colombia.

Charles A. Vana named director

. . . of research at Gas Atmospheres, Inc., of Cleveland. He served as supervisor of research for E. I. du Pont de Nemours & Co. and Ferro Corp. for 20 years.

Vana has recorded many patents, some world-wide, and his experience

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in the chemical field rates listing in the "Men of Science" treatise. His most recent research developed a packaged hydrogen generator and inert generator to produce high-purity preservative gases.

Delta Tank Mfg. Co., Inc. names ... Wayne D. Lutke as Midland district manager of its Oilfield Equipment Division, and Gary L. Clark to the Odessa office as a branch manager, announces B. W. Bourne, vice president, western regional operations manager.

W. D. Lutke

G. L. Clark

Lutke formerly served in West Texas for several petroleum-equipment manufacturers. Clark has served in tank erection, warehouse, and sales departments with other petroleum-equipment fabricators.

Bourne further announced that Lonnie P. Graham has been appointed sales representative in the Odessa oil and gas-equipment sales department, and that Don Burch has joined the firm's sales and service division.

Meanwhile Harold R. Anderson has become a sales representative for the Oilfield Equipment Division, serving Delta customers in the Casper, Wyo., area.

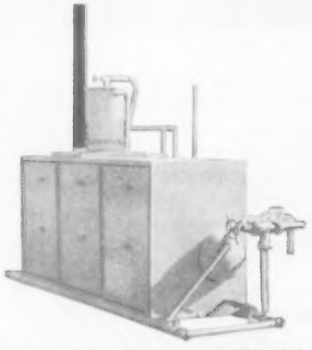
COMPUTER DEMONSTRATION is made by Dr. Dean E. Wooldridge (left), president of Thompson Ramo Wooldridge, Inc., for Dr. Maurice J. H. Ponte, president of Compagnie Generale de Telegraphie Sans Fil (CSF), at a recent press reception announcing formation of a new European corporation that will manufacture and sell the TRW RW-300 computer in the European common market. The new joint venture firm, Compagnie Europeene d'Automatisme Electronique, will also include Intertechnique of France as a third principal.

Two managers, salesman named ... to Delta Tank Mfg. Co., Inc.'s Laurel, Miss., office, announces Frank Keller, eastern division operation manager. District manager of the new oilfield division is Shirley C. Hewitt, former branch manager.

Oliver F. Kellams takes over as manager of the Laurel, Miss., branch. He was an office manager prior to his promotion. Named to the sales and service department in Laurel is Charles H. Maddox.

Meanwhile, James A. Kepley has become district engineer for Delta's Oilfield Equipment Division, making headquarters in the Midland, Tex., branch office.

SAUDER HD-1 UNIDRYER



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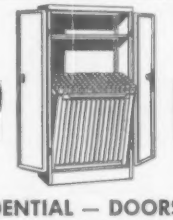
MAP  FILE

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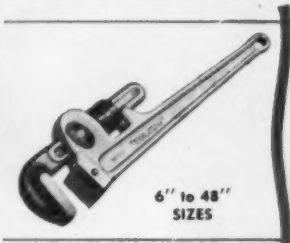
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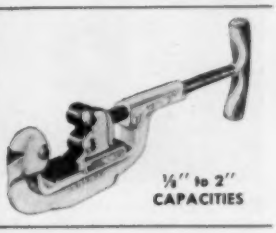
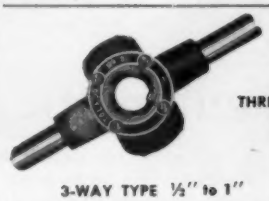
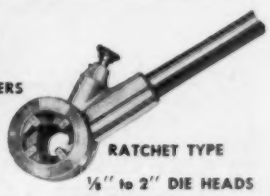
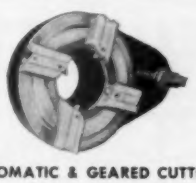

⅛" to 2" CAPACITIES


3-WAY TYPE ½" to 1"

THREADERS


RATCHET TYPE ⅛" to 2" DIE HEADS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THE TOLEDO PIPE THREADING MACHINE CO...TOLEDO 3, OHIO

THIS VIEW shows the equipment on the floor of H & S Drilling Co. Rig 2 drilling in North Louisiana. The unit is a Brewster N-95 and the deep rig is manufactured in Shreveport. Note the automatic slips with which the drill is equipped.

Big rig goes automatic

THIS modern heavy-duty rig is working in the Calhoun field of North Louisiana. Operation is the Humble Oil & Refining Co. 1 N. B. Golson located in 36-18n-1e, Ouachita Parish.

The contractor, H & S Drilling Co., Tulsa, has modernized this unit and it is about as automatic as any present-day rig can be. Rig 2 is a Brewster N-95 equipped with three Waukesha LRO's which are compounded. The derrick is a 133-ft. Lee C. Moore with a 700,000-lb. capacity. The draw works has air controls and since the above picture was taken, the rig has been equipped with National Model 6 Micromatic drilling controls. Other features include Kelco Products Co., Tulsa, automatic slips which are shown. The unit has an automatic weight recorder. An explosionproof lighting system has been installed. A large Emsco D-700 slush pump is one of the component parts.

The Calhoun area has been reactivated during the past few years since good production was encountered in extensions of the original producing area discovered in 1948. Pay formations of the field include Lower Cretaceous-Paluxy, Rodessa, Sligo, and Hosston. The Jurassic-Cotton Valley formation, original pay of the Calhoun field, is still a prime objective.

At last report the well was drilling just under 10,000 ft. and nearing total depth. This is one of two units that H & S has working in the area.

Active Rigs*

	Rotary	Cable	Total†
Alabama	3	0	3
Alaska	7	0	7
Arizona	2	0	2
Arkansas, South	22	0	22
California, Offshore	4	0	4
Inland	109	1	110
Colo., excl. Four Corners	14	2	16
Four Corners	11	3	14
Florida	2	0	2
Georgia	2	0	2
Idaho	0	0	0
Illinois	38	16	54
Indiana	11	24	35
Iowa	0	0	0
Kansas	114	19	133
Kentucky, western	6	51	57
Louisiana, North	92	0	92
South Inland	226	0	226
Offshore	62	0	62
Michigan	52	46	98
Mississippi	59	0	59
Missouri	1	1	2
Montana	No report		
Nebraska, East	2	0	2
West	19	0	19
Nevada	3	1	4
New Mexico, East	78	24	102
West	39	7	46
North Dakota	14	0	14
Okla., excl. Panhandle	No report		
Panhandle	24	12	36
Ohio	5	107	112
Oregon	1	0	1
South Dakota	1	2	3
Texas, Offshore	1	0	1
East	59	0	59
Upper Gulf Coast	88	0	88
North	98	0	98
Panhandle	52	7	59
S.W. Corpus Christi	134	0	134
S.W., San Antonio	32	3	35
West	199	25	224
West Central	84	18	102
Utah, North	9	0	9
South	12	0	12
Washington	1	0	1
West Virginia	6	218	224
Wyoming	58	3	61
Reported U. S. Total	**1,856**	**590**	**2,446**

*Report to AAODC by the International Oil Scouts Association.
†As of July 22, 1960.

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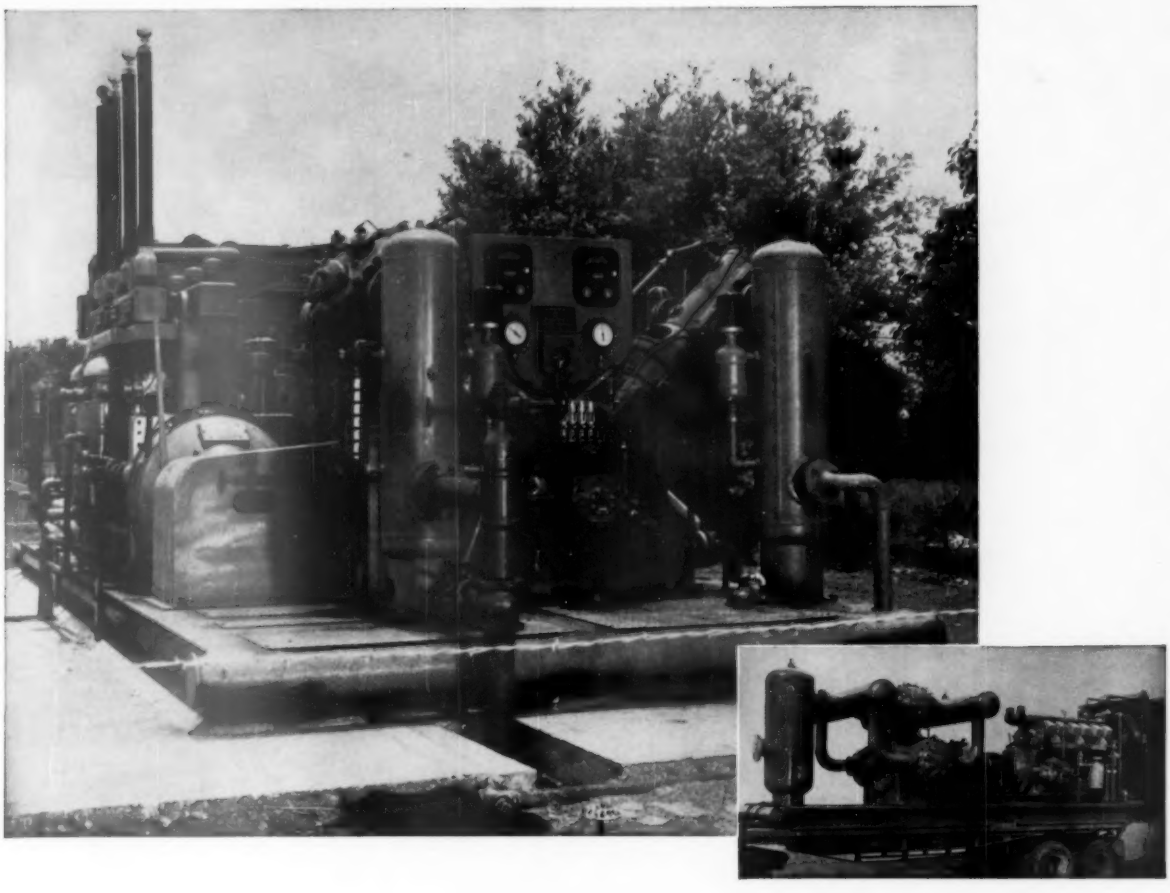

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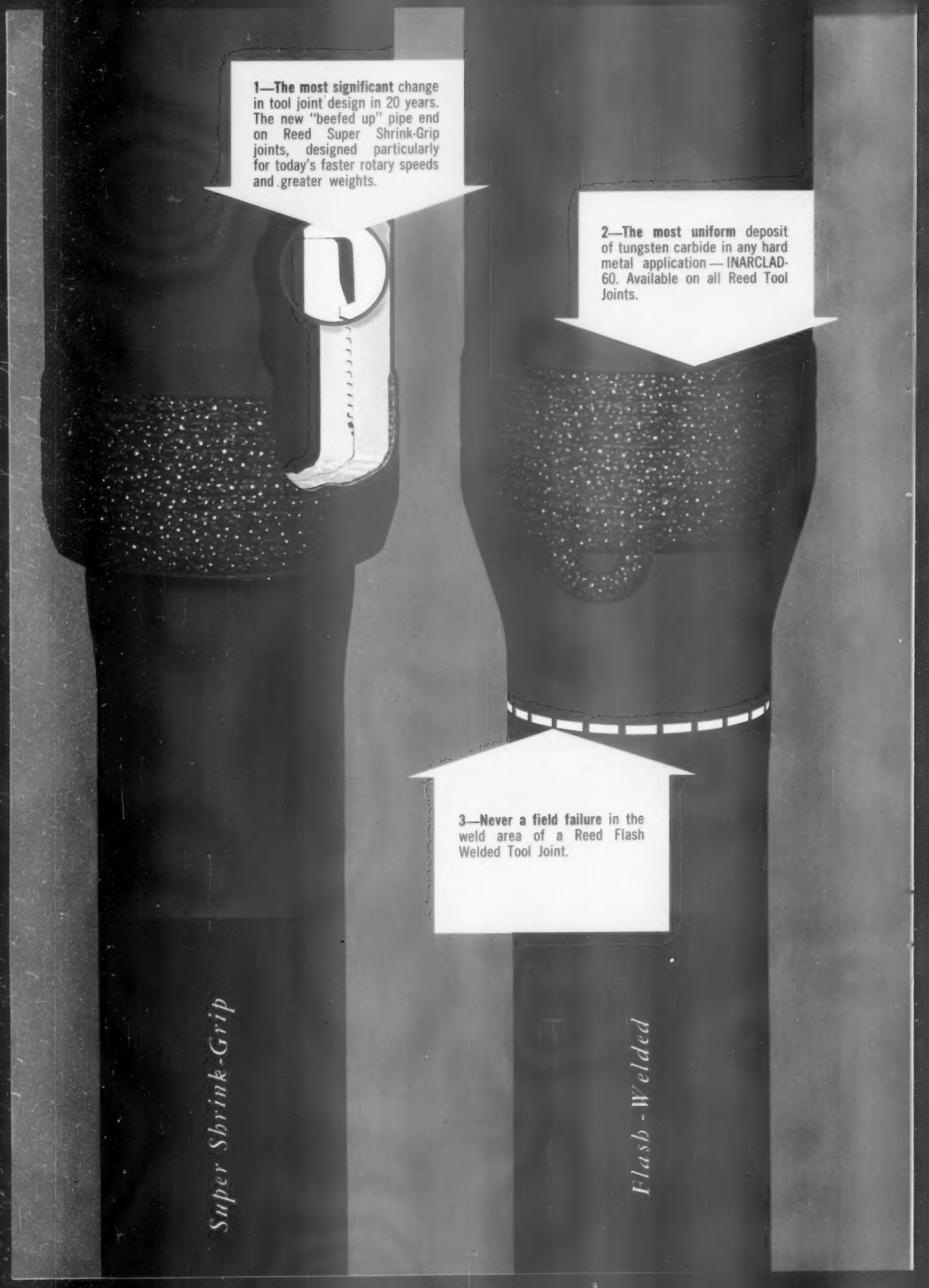
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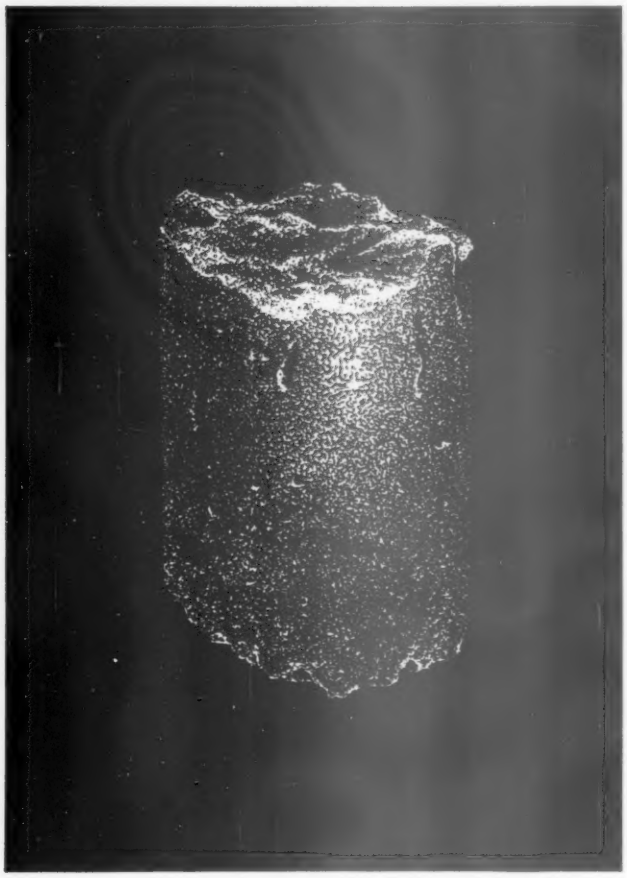

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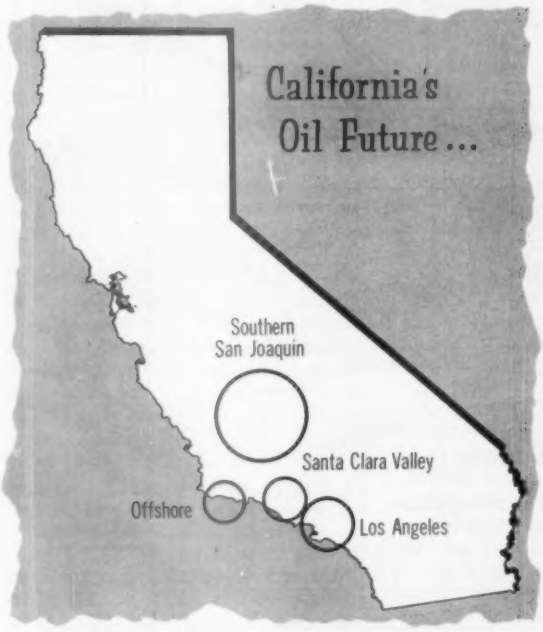


THESE FOUR CIRCLED AREAS are the most likely sources of new oil for California, according to West Coast explorationists.

Street-corner drilling prescribed for L. A.

. . . as operators move downtown in a search for new California reserves. Offshore, other new fields may develop, but economics are vague.

BY CARL J. LAWRENCE
West Coast Editor

ONE OF THE biggest boosters for California's future as an oil-exploration province is the president of the West Coast's biggest oil company.

Howard G. Vesper, president of Standard Oil Co. of California, Western Operations, Inc., says there is still a lot of exploring to be done in California, both onshore and offshore.

Land areas . . . At a recent press conference, Vesper cited three onshore areas which look good to his company: The south portion of the San Joaquin Valley, the Santa Clara Valley area, and the city of Los Angeles.

Although there are many established oil fields within the Los Angeles city limits, Vesper says there is "still much work to be done" testing the city with deeper drilling.

He mentioned specifically the downtown area, and Standard of California is currently preparing to drill a 10,500-ft. wildcat almost in the heart of downtown Los Angeles. Site of the test is near Seventh Street and Alameda Avenue, which is about a mile from city hall and 1½ miles southwest of Boyle Heights field.

Vesper is not alone in his optimistic view toward town-lot drilling in Los Angeles, but there are many oil men who do not share his high opinion of onshore California as a whole.

Offshore . . . Oil men agree California's tidelands offer one of the biggest hopes for finding oil in the state.

Vesper says there's "a lot of oil" off California, but finding and producing it economically is questionable. He cited the 5,500-acre Summerland lease off Santa Barbara County as a good example of the high cost of California offshore operations.

California Standard and its partner have poured $25 million into the Summerland lease since 1957, but face the possibility of losing money from the operation. Socal holds the lease jointly with Humble Oil & Refining Co.

The lease, considered one of the best off California, is the only offshore concession carrying a 12½% royalty. The state is now leasing under a sliding royalty rate that begins at 16⅔%. Vesper says a 16⅔% royalty at Summerland would make the operation uneconomical.

One of Vesper's associates, K. H. Crandall, vice president of exploration for the parent Standard Oil Co. of California, recently gave some revealing figures on the Summerland operation.

Here's the economic breakdown Crandall gave for Summerland as of June 1:

. . . Daily drilling costs have averaged $10,000 since the first well was spudded in 1958. These costs, which alone total $7 million, cover only one offshore platform housing two rigs. They will go up when a second platform gets into operation later this summer.

. . . Bonus for the tract was $7,250,000.

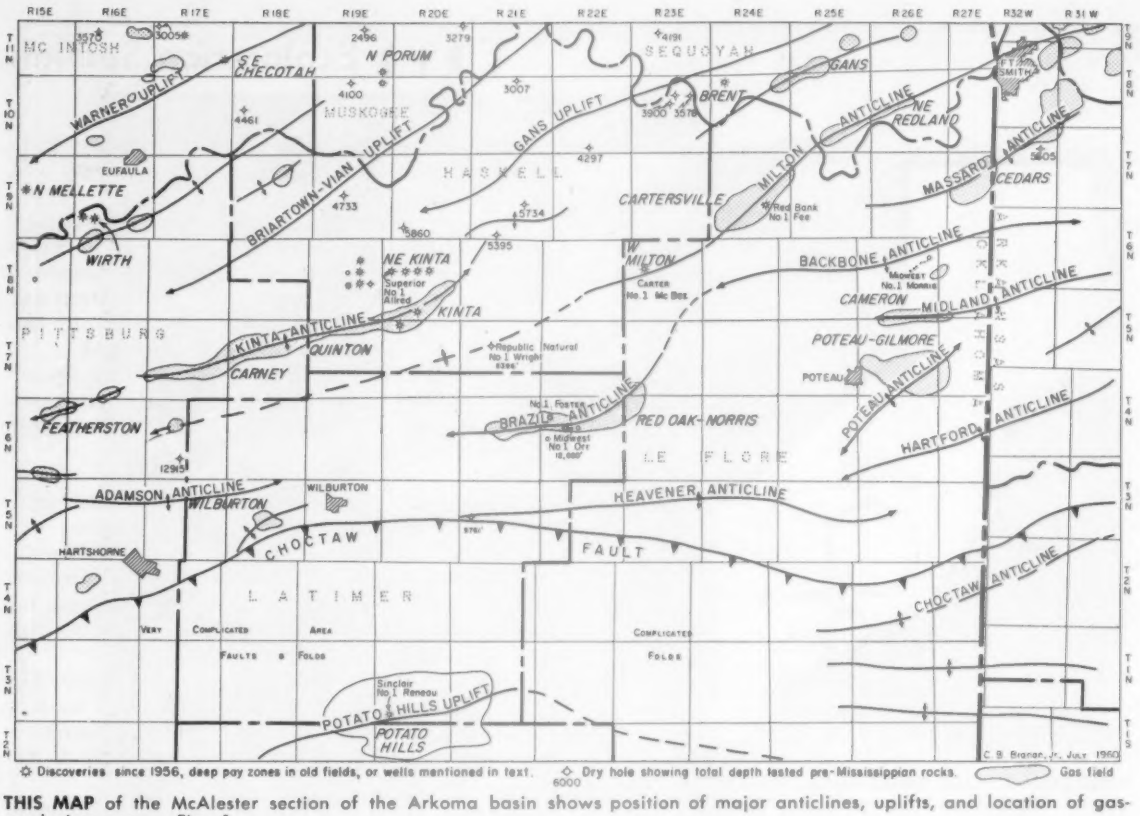
. . . Platform costs including power and cable equipment for the first platform have hit $8,750,000.

. . . Pipelines and onshore facilities have cost $2 million.

"In return for all this investment, the companies are now enjoying oil production at a rate slightly in excess of 2,400 bbl. a day," Crandall said. "The best present estimates place the proven and potential reserves of oil and gas equivalent at somewhat less than 15 million barrels recoverable and in place at Summerland.

"While these last figures may change, our best projections indicate that the chance for any profit at Summerland is vague."

Crandall pointed out Summerland has many favorable features, but even under these conditions the company may "still be only swapping dollars or even losing them."



THIS MAP of the McAlester section of the Arkoma basin shows position of major anticlines, uplifts, and location of gas-producing areas. Fig. 1.

Southeast Oklahoma reawakens as potential gas giant

BY C. B. BRANAN, JR., AND LOUISE JORDAN
Oklahoma Geological Survey, Norman.

These authors declare...

> "Regardless of the multitude of difficulties in unraveling the geology, the Ouachita Mountains should be an excellent province in which to explore for reserves of hydrocarbons."

TWO GEOLOGIC provinces in southeastern Oklahoma, the Arkoma basin and the Ouachita Mountains, have in the past been considered of minor interest to the petroleum industry.

With the increased demand for and value of natural-gas reserves, these two areas have come to the forefront of exploration in Oklahoma in the 1959-1960 period. Recently two geologically and economically significant tests drilled in Latimer County have resulted in natural-gas production: one on the Brazil anticline in the McAlester sector of the Arkoma basin, and the other south of the Choctaw fault in the Potato Hills area of the Ouachita Mountains (Fig. 1).

The Choctaw fault forms the boundary between the basin and the Ouachita Mountains in Oklahoma. North of the fault in the basin lies a series of northeastward and eastward-trending gentle synclines and narrower more sharply folded anticlines, some of which, called uplifts, are structurally more complex than simple anticlines. South of the Choctaw fault is the area of complexly folded and thrust-faulted rocks of the Ouachita Mountains.

Prepared for Oklahoma Geology Notes, June 1960.

Gas not new. Gas has been produced for local consumption in the McAlester sector of the Arkoma basin for more than 50 years. Production is mainly from the Hartshorne (early Desmoinesian) sandstone, ranging in depth from 500 to 3,500 ft. The wells had initial rock pressures between 150 and 550 psi., yet some of the first wells drilled are still productive. In the Poteau-Gilmore field, eastern Le Flore County, the initial capacities of wells ranged from 250 M.c.f. to 8,000 M.c.f. per day; and initial pressures ranged from 118 to 365 psi.

In the Quinton and Kinta districts of eastern Haskell and western Pittsburg counties, initial capacities of wells ranged from less than 1 to as high as 50 M.M.c.f.d. Quinton field, discovered in 1915, had yielded more than 30,000 M.M.c.f. of gas by the end of 1933 with an average wellhead pressure drop from 530 to 78 psi. Perhaps this shallow production is of minor

importance when compared with what the basin holds in the deeper, thicker, and more numerous Atokan and Morrowan sandstones.

First deep gas. The first significant deep gas production in southeastern Oklahoma was discovered in 1930 in basal Atokan sandstone, called the Spiro sand, by Red Bank Oil Co. 1 Fee in 23-9n-24e, LeFlore County. The well was drilled on the crest of the Milton anticline to a total depth of 6,300 ft. Gas with an open-flow potential of 5.5 M.M.c.f.d. was found at a depth of 5,403-21 ft.

During World War II years a total of 13 producers was drilled and the area became known locally as Spiro field (the official name is Cartersville field). Primarily because the gas has been used for local consumption in nearby Fort Smith, Ark., exact recoveries are not known, but the 13 wells have produced in excess of 80,000 M.M.c.f. with a pressure decline of from approximately 1,000 psi. to approximately 500 psi.

In 1958, LeFlore County Gas & Electric Co. and Carter Oil Co. drilled on the Milton anticline 7 miles southwest of Cartersville field. Gas was found in the Spiro pay at 5,515 ft. in the 1 McBee Harrison (SE SE NE 17-8n-23e). Initial open-flow potential of the well was 7.6 M.M.c.f.d. of gas with a shut-in pressure of 1,110 psi. from a net pay 63 ft. thick. The well, discovery of West Milton field, may be an extension of the Spiro pool of Cartersville field and thus the area on the anticline between the fields may be productive.

1952. The second indication that major gas reserves exist in southeastern Oklahoma came in 1952 when Superior Oil Co. completed its 1 Allred in 18-8n-20e, Haskell County. The well, located on the North Kinta anticline, has a total of 70 ft. of productive Spiro and Cromwell (Morrowan) strata between the depths of 5,600 and 6,100 ft. Combined open-flow potential of the zones was approximately 30 M.M.c.f.d.

The gas is nearly pure methane (98.5%) as is all other gas in the Arkoma basin. Superior drilled two more producers in the field in 1955. Operators have added seven wells, and one well is now being drilled. Oklahoma Natural Gas Co. is the gas purchaser. The official field name, now Northeast Kinta, was first East Lona, and later West Kinta.

Basin awakes. Lack of a market outlet has been the exploration deterrent in the Arkoma basin. Even with excellent producing wells as indicators, the area remained dormant until May 1959. At this time Midwest Oil Corp. ventured southward into Latimer County to drill deep on the Brazil anticline.

"Lack of a market outlet has been the exploration deterrent in the Arkoma basin. Even with excellent producing wells as indicators, the area remained dormant until May 1959."

The test, 1 Orr, near the center of SW 8-6n-22e, is within the area of the old Red Oak-Norris field, and is about 12 miles southeast of the Superior wells on the North Kinta anticline. First production in Red Oak-Norris field was from the Gladys Belle Oil Co.'s well drilled in 10-6n-21e, in 1912.

In 1939, records showed that 18 wells had yielded gas in commercial quantities from the Hartshorne sandstone, ranging in depth from 1,500 to 2,000 ft. beneath the surface and extending over a belt 1½ miles wide and 9 miles long. At that time the largest producer recorded was the LeFlore Co. G. & E. No. R.O. 12, McFerran, in SE SW SE 2-6n-22e, which had an initial daily flow of 25 M.M.c.f. at a rock pressure of 555 psi.

Midwest Oil Corp. and Frankfort Oil Co. 1 Orr (elevation: 600 ft.) was drilled to a total depth of 12,650 ft. into Mississippian shales. Atokan rocks were encountered at 1,780 ft. below the surface and had a drilled thickness of more than 9,800 ft. The Wapanuka limestone (Morrowan) was reached at a depth of 11,643 ft. and the Cromwell sand was found between 12,070 and 12,158 ft. There is some doubt that this well is bottomed in Mississippian, but this should be resolved by one of the presently drilling offsets. Two gas zones were discovered in the Atoka: a mid-Atoka sandstone, called Road Oak by the operators, 135 ft. thick from 7,180 to 7,335 ft. with open-flow gas potential of approximately 20 M.M.c.f.d.; and a basal Atokan sandstone, called Spiro, between 11,510-70 ft. with open-flow potential of 17.8 M.M.c.f.d. A bottom-hole shut-in pressure of 4,775 psi. was recorded in the Spiro sand. The well has been dually completed and a second well, the 1 Foster, the west offset, has encountered the Red Oak zone with an open flow of 20 million and is now coring the Spiro section. Two other wells are drilling on offsets.

More than any other single event, the drilling of the 1 Orr created the intensive leasing campaign and the current exploratory drilling in the Arkoma basin. As late as January 1959, acreage could be purchased on any major structure, even the producing ones, for as little as $1.00 per acre. Since the advent of the Midwest well, prices have soared and most of the basin proper is under lease. The synclines as well as the anticlines are being leased.

Geologic importance. The Midwest well revealed several points of major geologic importance. First, it is possible that structure is only coincident to production. Second, thick sandstones in the Atoka formation pinch out as the section thins northward, indicating possible stratigraphic entrapment of hydrocarbons. Most of the folding in the basin is the result of late Pennsylvanian or early Permian diastrophism. The folds on the surface may be only superficial, diminishing with depth as is the situation with much of the folding in the Ardmore basin to the west. Gas could have been trapped long before the folding occurred. Another point of significant interest is that little water has been found in Atokan sandstones. The sandstone normally is either well cemented and nonporous or it produces gas regardless of structural position. These remarks are only speculations and it is obvious from the lack of well control to deeper zones that geologists have a great deal to learn. In the near future the main undrilled features in the area should be drilled. Midwest recently has staked its 1 Morris SW NE 12-8n-26e, a wildcat to be drilled to 9,000 ft. on the Backbone anticline. Rumors are that well deals are brewing on the Adamson, Heavener, and Poteau structures.

The deepest test in the southern part of the basin, about 8 miles north of the Choctaw fault, is the 1 Manschrick, drilled in 1954 by Magnolia Petroleum Co. in C SE NE 28-6n-17e. In this unsuccessful test, Atoka rocks were 6,564 ft. thick; pre-Atokan, post-Arbuckle sequences were 2,242 ft. in thickness; and 779 ft. of the Arbuckle group were penetrated to a total depth of 12,915 ft.

The second well of significance in 1959 for southeastern Oklahoma is that drilled in southern Latimer County by the Sinclair Oil & Gas Co. south of the Choctaw fault in the Ouachita Mountains. This test, the 1 Reneau (C SE NW 32-3n-20e) was located in the Potato Hills, a structure which has long been discussed by geologists. The wildcat was completed for a calculated open-flow potential of 1.85 M.M.c.f.d.

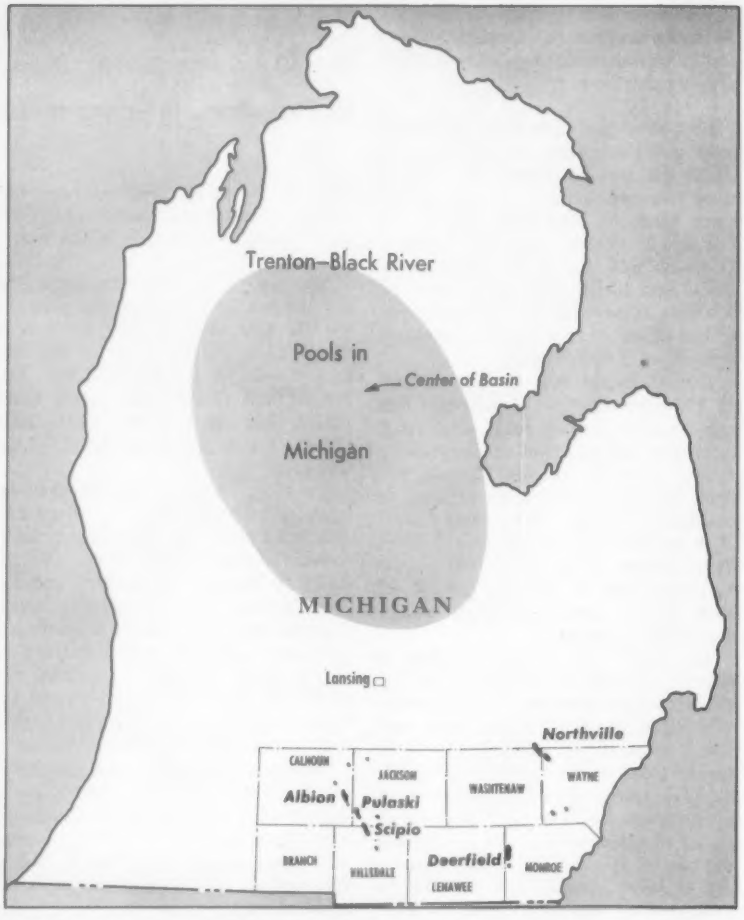
of gas with no water from the Big Fork chert (equivalent to the Viola) at 2,340-2,410 ft. The well, starting in Stanley shale at the surface, penetrated several thrust faults in the Big Fork-Womble section and drilling stopped at a total depth of 7,097 ft.

Barrier. The Ouachita facies of rocks south of the Choctaw fault have always presented a formidable problem to geologists of Oklahoma. Pre-Stanley rocks are exposed in only three areas in the Oklahoma portion of the Outchita province, McCurtain County, and Black Knob Ridge. In the remainder of the mountains, the younger Stanley, Jackfork, Johns Valley, and Atoka formations crop out and have an aggregate thickness of at least 22,000 ft. The rocks are mostly clastics; shale is predominant in the Stanley, whereas sandstone is predominant in the Jackfork, and sandstone and shale are in about equal proportions in the Atokan. Rocks of the sequence are similar in appearance and contain poor fossil control.

Because of intense folding and repetition of beds due to complicated thrust patterns, the geology of the Ouachitas is difficult to interpret at the surface. In the subsurface, where one drills a 9-in. hole and drill cuttings are the evidence of rock types, problems of interpretation are multiplied. Max Pray's 1 Wyrick, test drilled in 1958 in the northeast corner of Atoka County (26-1n-14e) to a total depth of 12,088 ft., is a good example. Stanley shale and sandstone were drilled from surface to 8,200 ft. Arkansas novaculite was recognized from 8,335 to 8,400 ft.; Folk Creek from 8,400 to 8,420 ft.; Big Fork cherty limestone from 8,420 to 9,098 ft.; and Womble shale from 9,098 to 12,088 ft. A dipmeter survey to the depth of 8,420 ft. gave the following results: SE dips to 3,795, NW dips to 4,150, SE dips to 6,056, SW dips to 6,922, SE dips to 7,424; NW dips to 7,952, and SW dips to 8,420 ft. This well had several shows of gas and one show of oil.

The Choctaw fault dies out eastward into Arkansas and is not mapped on the surface. In general, the intensity of faulting diminishes from west to east in the mountains. The geology of the Arkansas portion of the mountains is more simple and should be studied in greater detail to solve some of the problems that exist in the Oklahoma portion.

Certainly structural and stratigraphic traps, massive - sandstone reservoirs, known oil and gas production, and deposits of asphaltite are present in the Ouachita province. In fact, Oklahoma was the leading state in production of grahamite for nearly 25 years in the early part of the twentieth century.



HERE ARE the Trenton-Black River Ordovician oil fields in Michigan. These fields all lie in the southern part of the basin.

New Trenton extensions boost Michigan production

BY ROBERT E. IVES
Petroleum geologist,
Michigan Geological Survey Division,
Department of Conservation,
Lansing.

DRILLING and lease activity increased significantly in Michigan during the past year. Most of this increase can be attributed to the discovery and current development of a Trenton-Black River Ordovician fracture trend in the south-central part of the state. Good producers, large lost circulation zones, blowouts, and high proration have attracted the attention of the petroleum industry throughout the nation.

As of May 1 there were 178 oil wells located along the trend, averaging 19,731 bbl. of oil daily. The trend is still in an active development stage with operators drilling inside locations and attempting to extend the fracture zone. There is also an extensive search being conducted for similar features in the south-central part of Michigan.

This is an abrigded version of "Trenton-Black River Formation Developments in Michigan," presented at the 1960 midyear meeting of Interstate Oil Compact Commission, Detroit. June 1960.

Previous Trenton output. All previous Trenton-Black River production was concentrated in southeastern Michigan. Most of the subsurface control was in that area with scattered tests across southern Michigan. Outside these limited areas only about 10 Trenton tests had ever been drilled in the state.

Throughout the producing area, the Trenton-Black River sequence is es-

sentially grayish-brown to brown, crystalline limestone with some carbonaceous partings. Thickness varies from 400 ft. in southwestern Michigan to 900 ft. in eastern Wayne County. About midway between the Trenton-Black River section is a thin, black, carbonaceous unit. The base of this unit is considered by many to be the top of the Black River. A 5-25-ft. dolomite section is present at the top of the Trenton in this general area.

Production from the previous Trenton fields in southern Michigan has been associated with features along the flanks of pronounced structural features which trend north and northwest. In the producing areas the limestone has been altered to a secondary dolomite. A brief summary through 1959 of the two more important Trenton fields prior to the Scipio trend follows:

Deerfield

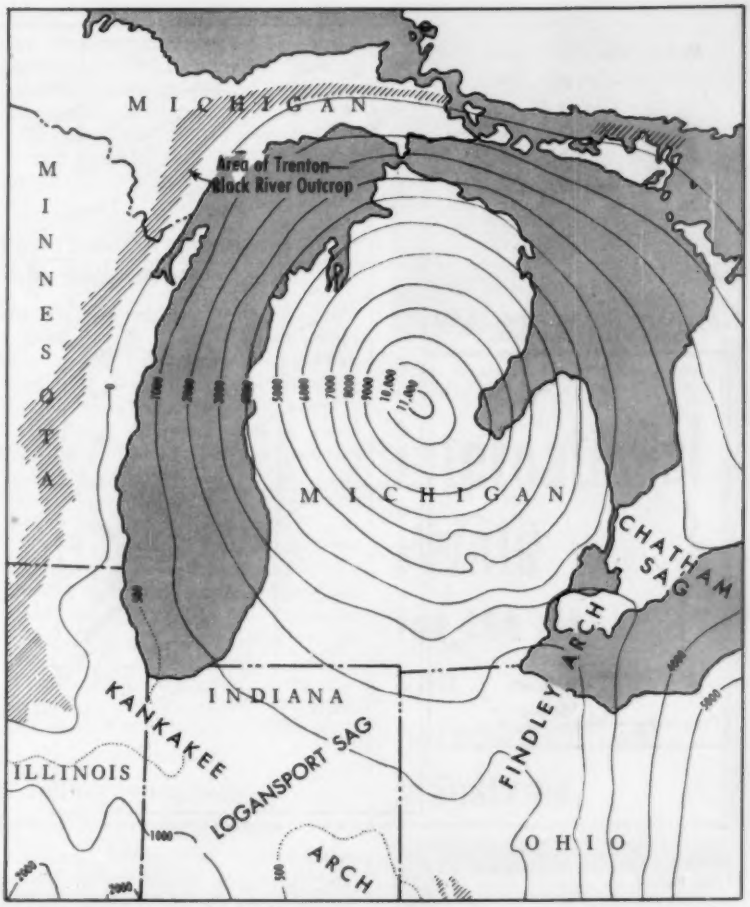
Discovery date	1920
Depth to Trenton	2,115 ft.
Net pay thickness	10 ft.
Total wells producing	37
Cumulative production	615,402 bbl.

Northville

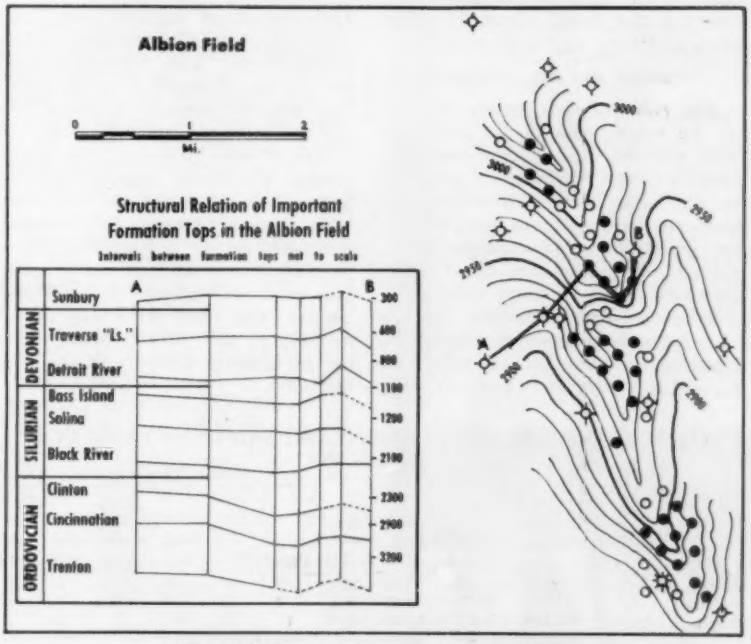
Discovery date	1954
Depth to Trenton	4,300 ft.
Net pay thickness	40 ft.
Total oil and gas wells	32
Cumulative oil production	548,479 bbl.
Cumulative gas production	6,620,118 M.c.f.

Albion-Pulaski-Scipio. The discovery well for Scipio field was spudded in May 1955. The test, Perry 1 Houseknecht, NW¼ SE¼ NE¼ 10 5s-3w, was drilled between two gravity highs. The first gas shows were recorded in September 1956 at a depth of 3,650 ft. It was not until January the next year that oil was found at 3,776 ft. The well was finally bottomed out at 3,900 ft. in July and was completed flowing 10 bbl. of oil hourly. The pool did not receive national attention until September 1957 when the fourth well to be drilled, Ohio Oil Co. 1 Stephens, blew out of control for 25 hours. A large lost-circulation zone was found at 3,770 ft. Operators tried to shut the well in, but the surface began to crater. About 4,000 bbl. of oil and 15 M.M.c.f. of gas were lost before the well was killed with salt water.

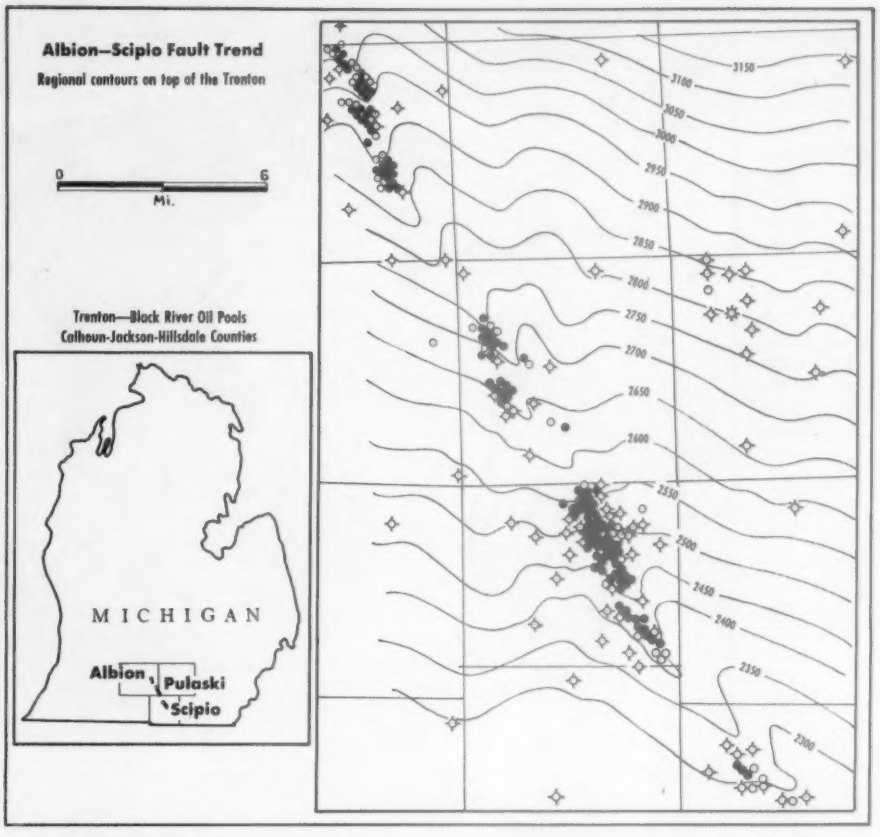
Albion. In December 1958 Albion field was discovered about 12 miles north and west of Scipio and aligned with that field. The discovery well, 1 Rosenau, was completed for an ini-



CONTOURS on base of Trenton and Black River limestones. Contour interval 1,000 ft.; —500-ft. contour added. Shaded area is Trenton-Black River outcrop. Adapted from Dr. Cohee's Preliminary Oil and Gas Investigations of 1945. USGS.



ALBION FIELD. Contours on top of the Trenton.



ALBION - SCIPIO fault trend. Regional contours on top of the Trenton.

tial production of 200 bbl. of oil daily from 4,324 ft.

Pulaski. Early in January 1959, a third discovery, Pulaski field, was opened on the trend between Albion and Scipio. Later completions have extended the trend about 35 miles north-northwest and south-southeast.

Structure and pay conditions

The Albion-Pulaski-Scipio trend is on the south flank of the Michigan basin with the various formations dipping north and northeasterly about 50 ft. per mile. Detailed structure contours on the Trenton indicate a shallow depression which plunges northwesterly. Contours on the Clinton definitely reflect the same flexure.

Other younger formations show a slight indication of the structure. However, the low vertical relief, 30 ft., makes it difficult to ascertain their relationship. Differential fracturing and subsequent dolomitization has occurred along the depressed trend. Production has been found throughout the Trenton-Black River section. Pays are irregular depending on the degree of fracturing and solution activity. They consist of vugular zones lined with white, crystalline dolomite tightly interconnected with fractures. Average oil pay thickness is about 60 ft. The over-all porosity is about 5% and the average permeability between 3 and 4 md. However, this varies greatly with the vugular sections. Some of the fractured and brecciated zones have been completely resealed. Reservoir energy is furnished principally by a large gas cap and gas solution with indications of a limited bottom hole water drive. The use of this energy will have a direct effect on the ultimate recovery of oil from the pools.

TABLE 1—STATUS OF THE ALBION-PULASKI AND SCIPIO POOLS AS OF MAY 1, 1960

Pool	Total wells	Oil bbls. /day	Gas M.c.f.d.	Water bbls. /day	Latest ave. G.O.R.	Well Status: Pump	Flow	Prod. wtr.	Making allowable	Testing	Shut-in gas well
Albion	54	5,360	5,108	230	953	3	46	19	18	2	3
Pulaski	33	3,493	2,976	150	852	2	27	6	16	1	3
Scipio	91	10,868	7,021	1,203	646	11	74	51	52	1	5
Total	178	19,731	15,105	1,583	766	16	147	76	86	4	11

Wells are presently prorated at 125 bbl. of oil per day, but not allowed to produce in excess of 165 M.c.f. for the same period. Spacing is one well to 20 acres with the wells being located in the center of the northwest and southeast 10 acres of each 40-acre tract.

Future of area

The search for similar trends in the area has been somewhat disappointing to date. However, they have resulted in the discovery of two Trenton gas pools and one Trenton oil pool. The first gas discovery was by Bell & Gault Drilling Co. on the Bissell farm, Section 8-4s-2w, Hanover Township, Jackson County. This well found gas at a depth of 4,012 ft. It gaged more than 17 M.M.c.f.d. Several followup tests were drilled with no success. Another gas discovery was on the Prichard farm in Section 11-1s-3w, Springport Township, Jackson County. The well gaged in excess of 6 M.M.c.f. with some oil at a depth of 4,600 ft. It was completed early in 1960 and no followup tests have been drilled. The small discovery of oil was on the Willis and Johnson farm in Section 17-4s-6w, Tekonsha Township, Calhoun County. This well, after sand fracturing, is producing about 10 bbl. daily from 3,553 ft. No more wells have been drilled.

The discoveries indicate that additional fracture zones are present in the general area.

Exploration for the type of trend discussed above is both costly and hazardous. The silght differences in relief are not really depicted on regional contours, such as the Northville and Deerfield structures. If relief is indicated, it does not necessarily follow that a fracture or fault zone is present. However, regardless of the difficulties encountered, the gratifying results of the present trend have encouraged operators to carry on an extensive exploration program throughout southern Michigan.

Louisiana strike being confirmed

Recent discovery of oil production at Point Chicot, in Lafourche Parish, Louisiana Gulf Coast, is being confirmed with a long extension and possible opening of a new reservoir.

The confirmation is by Pioneer Oil & Gas Co. at its 2 W. Alton Jones which flowed clean oil in starting prepotential tests. Flow through 8/64-in. choke was under pressure of 1,100 psi. Its pay is perforated at 10,824-27 ft.

Location is nearly 2 miles east of Pioneer's discovery well (1 Jones), completed last May with 36°-gravity oil production from sand at 10,790-96 ft., and gas-condensate production from a deeper pay at 10,952-61 ft.

The new field is on the south shore of Lake Salvador, and west of the large Delta Farms field. It is about 20 miles south of New Orleans.

Duval County, Texas, fields may link

A possible linking of the producing areas of the Fitzsimmons and Robinson fields of northeastern Duval County, Southwest Texas, is indicated by a new gas discovery in the narrow gap between them.

Sun Oil Co.'s 1 R. Serna, the linking well, is rated good for 11,400 M.c.f.d. of gas from pay at 3,202-7 ft. Flowing pressure through ¼-in. choke was 1,100 psi.

The area is 10 miles northwest of San Diego.

New field opened in Texas' LaSalle

South Two Fingers is a new Wilcox producing area opened by Sun Oil Co. 1½ miles south of Two Fingers field in LaSalle County, Southwest Texas. The two areas are separated by dry holes.

Discovery well, 1 Storey & Reed, flowed 27 bbl. of 49°-gravity oil per day through ⅛-in. choke. Its pay is perforated at 5,549-53 ft. Flowing pressure registered 410 psi. with gas-oil ratio of 1,280 cu. ft. per bbl.

The original Two-Fingers field, opened in 1956, has one Wilcox well productive at 5,397 ft.

East Texas' Freestone taps Rodessa gas

Rodessa sand has proved productive of gas in a wildcat 1½ miles east of the Personville Travis Peak sand field in southern Freestone County, East Texas.

The new discovery well is rated good for 550 M.c.f.d. of gas, recovering 3 bbl. of condensate per M.M.c.f. Pay is perforated at 7,032-38 ft. Shut-in pressure is 2,400 psi.

It is a joint project of Thomas W. Clay, Jr.; J. Burns Brown, and G. C. Clark. Location is on their Jewell L. Crow lease in the J. P. Plummer Survey. It is 4½ miles southwest of Teague.

Travis Peak production in the discovery well of Personville field, opened in 1955, is at 7,638-74 ft.

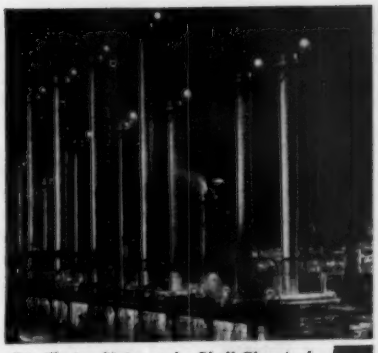
Manning leads way in Oklahoma's Kingfisher

Oklahoma's Manning trend in the Kingfisher County area continues to highlight drilling activity in the Sooner State.

Carter Division of Humble Oil & Refining Co. swabbed oil from the Manning Mississippian at 1 Beall in C SW NW 32-19n-6w. This is the third well at Southeast Hennessey field. Perforations at 6,773-6,821 ft. were swabbed for 15 bbl. load oil, 18 bbl. new oil, and 161 bbl. acid water in 12 hours. The operator is also testing in the Mississippi zone at 7,089 to 7,198 ft.

New test. Natural Gasoline Corp. will drill a wildcat on the trend in Garfield County, north of Kingfisher County. The 1 Charles Light, NE SE NE 33-21n-8w, will drill to 7,200 ft. Location is 4 miles northwest of a Texas Eastern Transmission Co. wildcat, the 1 Goff in C SW SE 14-20n-8w. That well is testing in Manning at 6,920-34 ft.

Pan American Petroleum Corp. will drill two wells on the north side of Southwest Kingfisher field. The 1 Mitchell unit, C NE SW 33-16n-7w, and the 1 Skala unit in C NE SW 29-16n-7w, will both drill to 7,900 ft. to look at the Manning. Both wells offset Apache Oil Corp. 1 Sioux unit in C NE SW 32-16n-7w. That well ex-



Distillation Units at the Shell Chemical Plant, Stanlow, Cheshire. Photograph by courtesy of Shell Refining Co. Ltd.

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tended the pool 1 mile north with 12,800 M.c.f.d. from the Manning at 7,804-45 ft. The field now links up with North Okarche field to the south, both having Manning production.

Calvert Drilling Co. will with others drill 1 Gazin-Robinson unit in C NW SE 10-17n-7w. This well is northwest of L. H. Armer 1 Gazin in C NE NW 14-17n-7w. This opener of South Dover field flowed 20 M.M.c.f.d. from Chester Mississippian at 7,115-25 ft. The new well will go to 8,000 ft. or Hunton.

Second zone. Cabeen Exploration Co. is testing in Manning at 1 Reiswig in C NE NW 21-19n-7w, an indicated discovery southwest of North Hennessey field. The well flowed 2,530 M.c.f.d. during test of the Manning at 7,210-7,315 ft.

Sinclair Oil & Gas Co. 1 Kudlac in C SW SW 10-19n-6w, East Hennessey field, flowed 3 bbl. of oil in 12 hours during swab tests of Manning at 6,521-51 ft. Previously it made 190 bbl. of oil in 13 hours through choke from the same zone. The Meramec got 204 bbl. per day on tests.

Oklahoma's Harper County adds new Viola discovery

New Viola Ordovician oil production was tapped in northwestern Oklahoma's Harper County at Stekoll Petroleum Co. 1 Weaver in NE SW 28-27n-21w, 5 miles northwest of Lovedale.

The well flowed 317 bbl. of 40.3°-gravity oil daily from perforations at 7,298-7,305 ft.

Beaver County. Morrow production is reported at a Beaver County wildcat in the Oklahoma Panhandle. Discovery well is Anderson Prichard Oil Corp. 1 Flock in SE SE NW 14-1n-25eCM.

The operator completed the well flowing 277 bbl. of 39°-gravity oil in 12 hours through 45/64-in. choke from upper Morrow at 7,928-46 ft. From the lower Morrow at 8,360-78 ft. the well flowed 68 bbl. of 39°-gravity oil in 12 hours through ½-in. choke.

Red Cave discovery finaled in Texas Panhandle

The Red Cave Permian gas play in the northwestern Anadarko basin portion of Texas added another discovery last week at Phillips Petroleum Co.'s 1-A Coldwater geological test 22 miles southeast of Stratford in Sherman County.

This Panhandle field opener flowed 1,310 M.c.f.d. from Red Cave at 2,053-63 ft. The well is inside the old Panhandle-Hugoton gas field limits.

Red Deer area. A prolific gas discovery is reported in the Red Deer area of Roberts County in the Texas Panhandle.

Gulf Oil Corp. 2 Marion Osborne, 6 miles northeast of Miami in Section 26, Block B-1, H&GN Survey, flowed absolute open flow 330 M.M.c.f.d. from perforations in the basal Pennsylvanian conglomerate at 10,842-71 ft. Production from Granite Wash perforations at 9,570-90 ft. gave up 16 M.M.c.f.d. plus 23.6 bbl. condensate per million.

Eastern Kentucky well shuts down

In southern Elliott County, Homer Robinson wildcat 1 McDavid, Willard quadrangle, is shut down for orders at a total depth of 2,780 ft. Tops released on this test to date are Berea sand at 1,353 ft. and Corniferous lime at 2,038 ft.

At total depth, the well is thought to be in the Lower Silurian or Upper Ordovician.

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South Kismet sets busy pace for Kansas

One of the busiest areas in the southwestern Kansas portion of the northwestern Anadarko basin is at South Kismet multipay field, southeastern Seward County.

Two new-pay discoveries added Toronto and Lansing production to the long list of producers in the field. This area has Council Grove Permian gas, Cottonwood Permian gas, Marmaton Pennsylvanian oil and gas, Morrow gas, Morrow oil, Chester Mississippian gas, St. Louis Mississippian oil and gas.

The two new discoveries are Panhandle Development Co., Inc., 1 Simonson's dual-zone strike in C NE SE 26-33s-31w, 3½ miles southeast of Kismet. The well flowed 1,157 M.c.f.d. from Toronto perforations at 4,267-4,315 ft. after already getting the Council Grove pay at 3,080-3,145 ft. Deeper down at 4,450-82 ft. in Lansing, the well made more gas. No official completions in the field have been made as yet in Council Grove, Marmaton, and St. Louis, but all have indicated assured production from the pays.

Kingfisher's Dover area adds prolific pair

Oklahoma's Kingfisher County with 45 successful field-well completions out of the same number of tries this year under its belt, added two more prolific producers last week.

Carter Division of Humble Oil & Refining Co. completed 1 Patterson in C SW NW 13-18n-7w on the east side of North Dover field flowing at the daily rate of 696 bbl. through 20/64-in. choke from perforations in the Manning Mississippian at 6,891-6,911 ft. From 6,816-48 ft. the well tested 174 bbl. of 38.4°-gravity oil in 6 hours through the same choke.

King-Stevenson Oil Co. 2 Wells in C NE NW 27-18n-7w, Middle Dover field well, flowed at the daily rate of 969 bbl. from Manning perforations at 7,040-53 ft. on ⅜-in. choke.

Texas firm slates six-well Colorado drilling program

A Wichita Falls firm will drill half a dozen wildcats in Baca County, extreme southeastern Colorado. This bold wildcat program contains six Mississippian and Arbuckle tests in the northwestern reaches of the Anadarko basin.

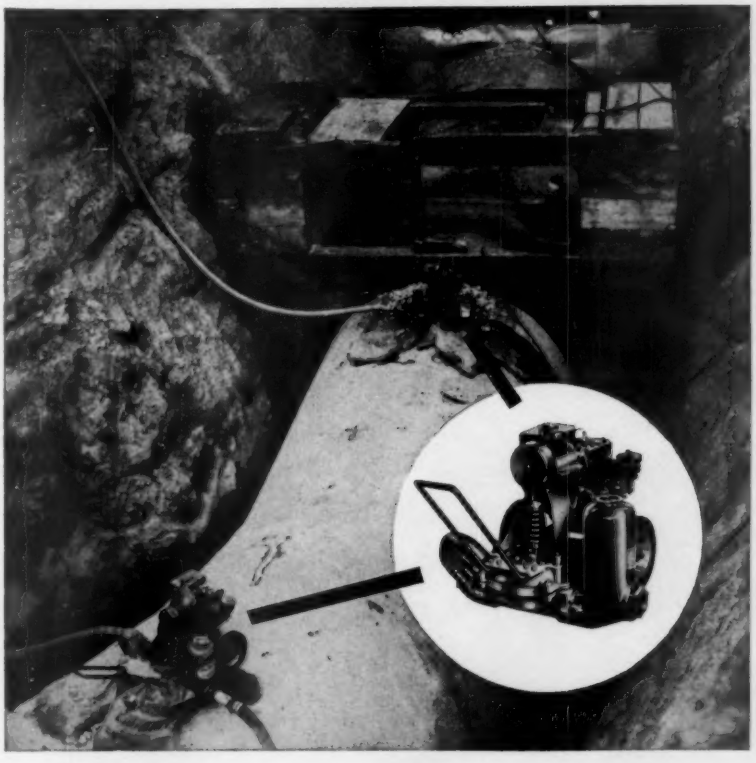
Moran Brothers, Inc., will go to 6,000 ft. at the 1 Homsher in C SW SW 30-28s-47w, 13½ miles northwest of Springfield, 23 miles southwest of Barrel Springs Morrow field. The 1 Goering will be in C SE SE 12-32s-48w, 26½ miles northwest of Prairie Dog field. The 1 Rice will be drilled in C NE NE 12-32s-49w, 31 miles northwest of Prairie Dog field. Moran 1 McArthur will go down in C SW NW 8-33s-50w, 37 miles northwest of Prairie Dog field and 3½ miles northwest of Estelene town. The 1 Cramer will be drilled in C NW SE 12-33s-50w, and 1 Singer will be in C NW NW 3-35s-50w, 2½ miles south of Carrizo town site.

Drilling perks up in Texas Panhandle

The sag in exploratory drilling in the Texas Panhandle apparently is abating. Discoveries in Mississippian and Pennsylvanian rocks were reported last week in Ochiltree County.

J. M. Huber Corp. 3 White, Section 57, Block 13, T&NO Survey, had a calculated open-flow potential of 13,800 M.c.f.d. from perforations in the Mississippian at 8,898-8,908 ft. and 8,920-37 ft. This field opener is located 9 miles northeast of nearest Mississippian production. It lies 5

57 DIAPHRAGM PUMPS ON THIS JOB...AND 47 ARE GORMAN-RUPP



The Brea (California) pipeline job consists of 14 miles of 96" cement-coated steel pipe. Diaphragm pumps were selected because they can be easily moved from bell joint as the welders progress. Contractors: Morrison-Knudsen, Inc. and Macco Corp. of Los Angeles.

Gorman-Rupp Diaphragm pumps are by far the favorite of contractors. These exclusive features show why: diaphragm drive rod spring-cushioned on down-stroke; suction accumulator for smooth pumping flow; antifriction, helical-ground gears and bearings operate in oil; one-man handling, engine-driven 3" pump only 120 lbs., job-to-job.

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Jones & Laughlin Supply Division works closely with producers throughout the United States and Canada. Our complete line of quality production equipment can handle your toughest production problems.

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Your files should include a copy of our brochure on waterflooding and disposal. J&L engineers have the design experience and the equipment to provide outstanding service in secondary recovery and salt water disposal programs.

Performance proved Cabot Units are designed and built to give steady trouble-free service. Ask your J&L Supply man for Cabot Catalog 60 for complete information on this advanced line of beam balanced and crank balanced units.

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*Produced under license from The Gray Tool Company.

Jones & Laughlin

SUPPLY DIVISION – Tulsa

miles south of Farnsworth inside Farnsworth upper Morrow field.

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OSR-12

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Reef find. There is an apparent Pennsylvanian reef discovery in northwestern Mitchell County, 5 miles northeast of Vincent.

Carl Johnstone, Jr., 1 Dunn recovered oil on drill-stem tests at 7,490-7,590 ft. and 7,551-85 ft. A straddle-packer test was made at 7,474-7,508 ft. Location is in Section 64, Block 20, Lavaca Navigation Co. Survey, ½ mile northeast of Dunn Pennsylvanian field.

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On actual flow tests, the well made 2,111 M.c.f.d. through 12/64-in. choke with pressure of 2,415 psi. Flow through 9/64-in. choke was at the rate of 1,189 M.c.f.d.

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DeSoto Parish:

D. B. McConnell 1 I. L. Robertson, C NW NW 27-11n-12w, 3½ miles southeast of Oxford. IPP 15 BOPD, 45°, perf. 2,872-76 ft., Paluxy. TD 2,917 ft. Extends Oxford field.

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Growth in Mid-Continent Seen

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THE MID-CONTINENT has three big basins of promise and the best of these is the vast Anadarko.

This is the view of Guy E. Campbell, new production manager of Sun Oil Co.'s Mid-Continent division, which headquarters in Tulsa.

The other two basins, he says, are the McAlester and the Arkoma, which straddles the Arkansas-Oklahoma border.

In the Anadarko, which spreads under five states—Oklahoma, Kansas, Texas, New Mexico and Colorado—Campbell looks for continued gas development.

It was Sun which opened up the big Laverne gas district in the basin with a 1955 wildcat. At that time Campbell was land manager for the division.

Campbell also sees the possibility of a major breakthrough in the Anadarko with several deep wildcats scheduled in the next 18 months in the Oklahoma part of the basin.

These deep tests, which will go from 20,000 to 25,000 ft., will probably be drilled as joint ventures with Sun as a participant. Anadarko's deepest producer, which is also Oklahoma's deepest, is a Knox field well yielding from 16,546 ft.

A Mid-Continent background . . . Campbell knows his Mid-Continent area well. He has been in the region for 39 years.

A native of Pittsburgh, Campbell graduated from Pennsylvania State University with a bachelor of arts degree. Shortly after his graduation, he came to Oklahoma and got his start in the oil business.

The firm he joined was the Camdon Co. It had been formed by his father, Guy E. Campbell, Sr., who for many years was a member of Congress from Pennsylvania, and Frank Donaldson, who had been West Virginia district superintendent for Transcontinental Oil Co.

The small producing company had a lease at Bixby. There were two or three pumping wells and their output was about 120 bbl. daily. Campbell was secretary-treasurer.

In March of 1921, when Campbell returned to Pennsylvania to get married, the little company was doing fairly well. The price of crude was $3.50 a barrel.

Shortly after he returned from Pittsburgh with his bride, the crude market tumbled. The best price Camdon could realize for its oil was $1 a barrel. The post World War I recession had hit the oil business.

In those days of slim prices and markets it didn't take much more of a setback to break a company. In Camdon's case it was a dry hole which put the company under.

However, the folding of the company didn't do Campbell in, or force him out of the oil business.

He joined Transcontinental Oil Co. at Bristow. Later this company became a part of Ohio Oil Co., but Campbell didn't stay with the company that long. In 1926 he joined the Twin State Oil Co.

Twin State was a producing subsidiary for Sun Oil and operated in the states of Oklahoma and Kansas. Campbell's first position with the company was in the title department. During the depression, he worked in scouting for the firm.

By 1944, when Campbell was promoted to manager of the land department, the company had become the Mid-Continent division of Sun Oil. On April 1 of this year he was named acting manager of the division and he became manager several weeks ago.

The division is still the producer for Sun in Oklahoma and Kansas. It has a 100% interest in about 400 wells in the two-state area and a partial interest in many more.

"The Mid-Continent still has room to grow." Campbell says, "but its growth, of course, is contingent on its market outlet. If and when the area gets more transcontinental gas lines, development will certainly be stimulated."

▶▶▶ Personals

Joseph F. Mueller has joined Keplinger & Wanenmacher, petroleum engineers, in Tulsa. He will handle oil and gas reserve estimates and special reservoir studies.

Cameron L. Cox, district superintendent for Sinclair Oil & Gas Co. in Jackson, Miss., and **John J. Fiegener,** senior petroleum engineer in Jackson, have been transferred to Sinclair's Lafayette, La., district office. **Laurence Harmon,** assistant district foreman in Lafayette, has been transferred to Morgan City, La.

L. D. Sullivan, director of Lion-branded sales for Monsanto Chemical Co.'s Lion Oil Co. division, has been named director of branded sales, a new position formed by consolidation of the Lion-branded and private-brand retail sales sections. **Frank C. Graves,** sales manager of Lion-branded products, has been appointed manager of private-brand retail sales.

Dr. J. P. Woods, director of Atlantic Refining Co.'s Dallas geophysical laboratory, has been elected president of Society of Exploration Geophysicists. He succeeds **T. O. Hall,** president of General Geophysical Co. Other new officers include **John C. Hollister,** Colorado School of Mines, Golden, Colo., first vice president; **Robert C. Kendall,** Shell Oil Co., Denver, vice president; and **Francis A. Hale,** California Standard Co., Calgary, secretary-treasurer. New officers will be installed at the society's annual meeting November 7-10 in Galveston, Tex.

WOODS

Max P. Watson, assistant to the president of United Gas Corp. and its subsidiaries, Union Producing Co. and United Gas Pipe Line Co., has been elected a director of United Gas Pipe Line.

Norman V. Kinsey, Jr., Kinsey & Kinsey, has been elected a director of Transcontinental Gas Pipe Line Corp. He succeeds his father, the late Norman V. Kinsey, on the Transcontinental board.

J. H. Echterhoff, assistant to the executive vice president of pipeline operations for United Gas Pipe Line Co., has been named district manager in New Orleans. He succeeds **R. G. Bryan,** who has been transferred to Lafayette, La., as district manager for Southwest Louisiana.

R. C. Newsome has been named manager of engineering design for Trunkline Gas Co. **A. W. McAnneny** has been named manager of engineering planning. **H. C. Williams** has been promoted to assistant chief engineer. Also, **L. V. Parent** has been appointed supervising engineer, planning, and **L. C. Sullivan** has been named supervising engineer, research. **J. B. Sellers** will be supervising engineer, pipelines.

Chuck Siewert has been named general manager of R. H. Fulton & Co. He will be in charge of all construction activities of the company.

R. Russell Turner, district superintendent in Casper, Wyo., for Pan American Petroleum Corp., has been named Alberta district superintendent with headquarters in Edmonton. **W. M. Jones,** Alberta superintendent, has been named Casper district superintendent.

O. K. Moore has been appointed group supervisor in the chemicals product development and technical service section of California Research Corp.'s Richmond, Calif., laboratory.

George F. Berry, Jr., district development geologist for Cities Service Oil Co. in El Dorado, Kans., has taken early retirement. Berry has been with Cities Service since 1927.

J. Wayne Hinds has been named general manager of Vigor Oil Co., Ltd., Oshawa, Ont., a subsidiary of Murphy-Canada Oil Co. Hinds had been with Frontier Refining Co. as manager of wholesale and retail sales in eastern Nebraska.

R. M. Dewar has been named manager of field operations in Honolulu Oil Corp.'s western division. **H. F. Pohlmann** will succeed Dewar as assistant manager, field operations, development and production. **John Boreta** has been named western division petroleum engineer.

F. F. Wright, executive assistant in charge of conservation and proration in Sinclair Oil & Gas Co.'s Tulsa general office, has been appointed assistant manager of the West Texas division in Midland. **Henry C. Calhoun,** executive assistant to the vice president and exploration coordinator in Tulsa, will take over Wright's conservation and proration activities.

J. D. Divelbiss has been named manager of Tidewater Oil Co.'s new Four Corners district, which has been formed by consolidation of the Durango, Colo., and Casper, Wyo., exploration districts. District headquarters will be in Durango. **W. P. Siard,** district geologist in Durango, has been named manager of the Oklahoma district in Oklahoma City. **Jim Wiley** has been transferred from the Oklahoma district to the Four Corners as scout.

New appointments in American Oil Co.'s manufacturing department include **R. M. Cash,** manager of operations; **F. W. Scheineman,** director of engineering; **A. H. Hayes,** manager of planning; **L. H. Butterworth,** manager of refineries; and **W. T. Herget,** director of technical services. Also, **A. G. Clark,** assistant manager of operations; **C. Feuchter,** assistant manager of costs; **G. W. Keranen,** manager of general engineering; **T. A. Abbott,** manager of engineering and technical service administration; **R. S. McDaniel,** assistant manager of process planning; and **F. Curtis Smith,** assistant manager of capital expenditure planning.

▶▶▶ Personals

Dub Baulch, gas production engineer, has been transferred from Jal to Houston by El Paso Natural Gas Co.

C. Kenneth Smith, Tulsa, will move to Houston, September 1, as a result of the Kirby Petroleum Co.'s Mid-Continent production division transfer of headquarters. Smith is production superintendent.

Fred H. Brinkman, Arthur L. Hicks, and **John W. Sicking** have been named section heads in the production research division of Jersey Production Research Co., Tulsa. Brinkman and Sicking will be responsible for technical service to producing affiliates. Hicks will be in charge of research on primary recovery techniques.

Homer O. Woodruff, assistant to the vice president in charge of the domestic producing department of Texaco Inc., has been named general manager, domestic producing department, in the New York offices. Woodruff joined Texaco in 1933. He has served in the domestic producing department as assistant manager of the Pacific Coast division, assistant general manager in Houston, and Tulsa division manager. He moved to New York as assistant to the vice president last year.

Byron Maxwell, United Fuel Gas Co., Charleston, W. Va., has been elected chairman of the eastern district of API's Division of Production. He succeeds **Wendell S. Moore,** Columbian Carbon Co., Charleston, who has been named chairman of the district advisory committee. New vice chairmen are **H. J. Magner,** Delta Drilling Co., Pittsburgh; **W. C. Best,** Gulf Oil Corp., Evansville, Ind.; **W. F. Eiting,** Humble Oil & Refining Co., Mattoon, Ill.; **H. T. Heuple,** Manufacturers Light & Heat Co., Pittsburgh; **J. Robert Horner,** Delaware Gas Co., Clarksburg, W. Va.; **Melvin Sauter,** Sun Oil Co., Mount Pleasant, Mich.; **John Kime,** Preston Oil Co., Columbus, Ohio; **Nace Mefford,** Ashland Oil & Refining Co., Ashland, Ky.; **L. T. Evans,** East Ohio Gas Co., North Canton, Ohio; **Fred Moran,** Owensboro, N. Y., independent; and **Earl Linn,** Hiawatha Oil & Gas Co., Pittsburgh. **D. C. Hubbard,** Ohio Fuel Gas Co., Columbus, was named secretary-treasurer.

Personals

H. B. Brown, general coordinator in Gulf Oil Corp.'s transportation department, has been elected an administrative vice president of Gulf and named coordinator of transportation. He succeeds **R. D. McGranahan,** who recently was named president of Wilshire Oil Co. of California. Brown has been with Gulf since 1950. He was marine coordinator before being named general coordinator in 1958. He will continue to headquarter in Pittsburgh.

BROWN

R. E. Nagle, chief engineer in the engineering department of Texaco Inc., has been transferred from New York City to Houston as part of the company's engineering operations move.

J. E. H. Davies, general manager of the markets department of BP Trading, Ltd., and **C. H. W. Smith,** general manager of the supply and development department, have been named directors of the company.

Roy E. Nystrom has been appointed manager of Creole Petroleum Corp.'s Amuay refinery. He succeeds **Hugh Wynne,** who has been transferred to Standard Oil Co. (N. J.). **Leonard G. Wannop** will succeed Nystrom as assistant manager at Amuay.

Jack Marshall, drilling superintendent for Continental Oil Co. in Oklahoma City, has been promoted to superintendent of the Oklahoma City production district. He succeeds **G. C. Sawvel,** who recently was transferred to Los Angeles. Marshall has been with Conoco since 1949.

Burt Clarkson, assistant head of the chemical products department at the Bayway refinery of Humble Oil & Refining Co.'s Esso Standard division, Linden, N. Y., has been transferred to Baltimore as assistant manager of the refinery there. **Ted Jeffers** has been named head of the alcohol division, chemical products department, at Bayway. He succeeds **Ed Gangluff,** who has been given a loan assignment in New York as East Coast coordinator in the operations coordination division. **Frank Walsh** has returned to Bayway as assistant head of the supply and distribution department after completing a loan assignment in New York.

Robert J. Collins, Ronald G. Graham, and **Robert J. Macur,** engineers in the Whiting refinery of Standard Oil Co. (Ind.), have joined the manufacturing department of Amoco Chemicals Corp.

S. G. Sanderson, vice president in charge of the Houston production department of Gulf Oil Corp., has retired after 47 years with the company. Sanderson was elected a vice president and transferred to Houston from Tulsa in 1957.

B. P. Nixon has been named production superintendent for Lone Star Producing Co.'s Oklahoma district in Duncan, Okla. He succeeds the late Ted Scott. Nixon has been with Lone Star since 1952. He had served as production engineer in Athens, Tex., and Jacksboro, Tex., before the new appointment.

G. R. Chenot, district geologist in Midland, Tex., for Standard Oil Co. of Texas, has been promoted to Midland division geologist. **C. R. Hensch,** division exploration superintendent in Dallas, has been transferred to Amarillo, in the same capacity. **J. C. Kern,** Amarillo exploration superintendent, has been transferred to Houston as division exploration superintendent. He succeeds **E. J. Smith, Jr.,** who has been named chief geophysicist in Houston. **J. K. Pawley,** formerly chief geophysicist, has been named assistant to the general manager, Houston.

Cyril O. Rhys, assistant director in Esso Research & Engineering Co.'s design engineering division, has been promoted to senior engineering associate.

Richard H. Butler, petroleum engineer with Union Oil Co. in Coalinga, Calif., has been transferred to Lovington, N. M., as unit engineer in the South Caprock Queen unit.

J. E. Trigg, partner in Trigg Drilling Co., Oklahoma City, has been elected a director of Tekoil Corp. A veteran driller, Tripp entered the oil business in 1919. Operations offices of Tekoil are in Oklahoma City, executive offices in Dallas, and regional offices in Midland, Tex. The company specializes in secondary-recovery operations.

D. C. Baker, district superintendent for Texaco Inc. in Lewistown, Mont., has been transferred to Billings, Mont., in a change of district office location.

Dr. C. Burke Miles, technical director of petroleum chemical applied research and development at the Paulsboro, N. J., laboratory of Socony Mobil Oil Co., Inc., has been named manager of Mobil Chemical Co.'s research and development department.

Deaths

Harris T. Dodge, 62, senior vice president in charge of world-wide sales for Texaco Inc., died July 29 at his home in New York. Dodge joined Texaco in 1920. He had been general manager of the foreign operations department (Western Hemisphere and West Africa) and vice president in charge of this department before being named senior vice president in 1959.

Roy M. Johnson, 79, Ardmore, Okla., independent, died July 30 in an Oklahoma City hospital of cancer. Johnson was one of the discoverers of Oklahoma's Healdton field and was also active in the early development of Fox, Graham, and Empire fields in southern Oklahoma and Ranger and Burkburnett fields in North Texas.

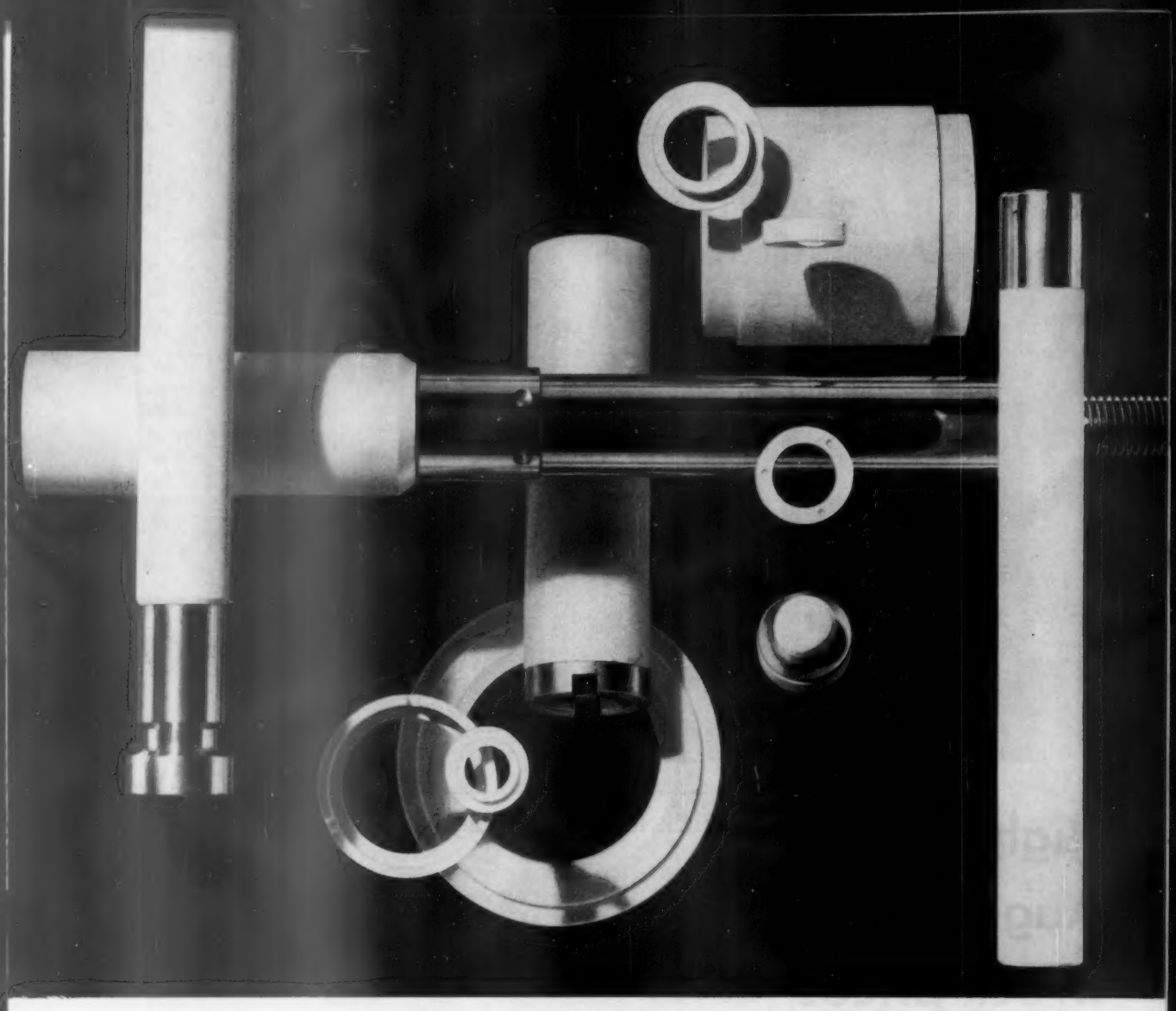
Charles Branch, 60, production superintendent for T. G. Jenkins, Fairfield, Ill., independent operator, was killed in an auto accident July 23 near Fairfield.

Charles A. Black, 62, retired Tulsa independent operator, died August 2 in a Tulsa hospital of a heart ailment. Black was with Sinclair Oil & Gas Co. before becoming an independent in 1938. He retired in 1953 because of poor health. His brother, John Black, retired drilling contractor, died 2 weeks ago (OGJ, Aug. 1, p. 234).

J. R. Hayden, 78, retired land man for G. H. Vaughn Production Co. in Dallas, died July 27 in a Dallas hospital. Hayden was vice president of the old Superior Oil Corp. in Tulsa before moving to Dallas in 1939. He retired in 1957.

Fred Earhart, Jr., 49, Houston office manager for Ernest Cockrell Oil Products Co., died July 28 in a Houston hospital.

William H. Henszey, 70, president and owner of Refiners Marketing Co., died July 31 in a Los Angeles hospital.



Leading Oil Field Pump Manufacturers Use Coors Alumina Ceramics to Fight Abrasion

Waterflood is hard on pumps! That's why leading pump manufacturers are supplying plungers of Coors Ceramic for their multiplex pumps. Users find these ceramic plungers wear several times longer than plungers of expensive metals.

Coors Alumina Ceramics are extremely hard — equal to a sapphire in hardness. This property makes the plungers very resistant to abrasion, plungers do not easily score nor wear down in the areas contacting the packing. The very smooth surface finish is maintained over a long period, greatly increasing packing life. The ceramic is chemically inert — it does not corrode nor pit in service. It has a tensile strength of 17,000-18,000 PSI and a compressive strength of over 240,000 PSI.

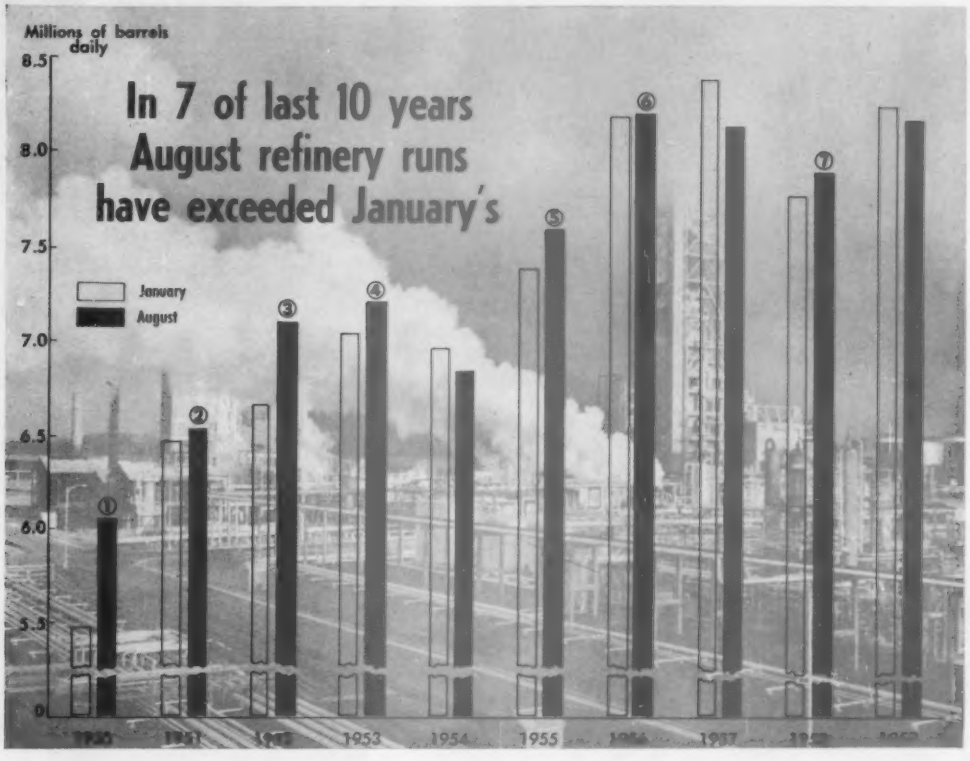
Manufacturers of positive displacement metering and proportioning pumps find plungers of Coors Alumina Ceramics give long, accurate service — because of its hardness and abrasion resistance, and its chemical inertness.

Coors Alumina Ceramics are also used in rock bit nozzles, chokes, ball check valves, and sleeve protectors for multiple completion wells.

Chokes of Coors Ceramics are available through oil field stores. Pump plungers and other ceramic parts are available only through the equipment manufacturers. Coors does not supply direct, but we will be glad to give you names of all manufacturers using our ceramic in their equipment. If you are having abrasion or corrosion problems, ask your equipment manufacturer about Coors Alumina Ceramics!

Coors **Alumina Ceramics**

COORS PORCELAIN COMPANY • 600 NINTH STREET, GOLDEN, COLORADO



High runs in August can wreck prices

BY JOHN C. CASPER

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,827,000	DOWN	29,000	UP	47,000
Crude stocks	244,916,000	DOWN	1,001,000	DOWN	19,816,000
Completions	937	UP	130	DOWN	85
Refinery runs	8,290,000	UP	86,000	UP	293,000
Gasoline stocks	193,195,000	DOWN	1,584,000	UP	6,699,000
Kerosine stocks	29,797,000	UP	264,000	UP	496,000
Distillate stocks	128,941,000	UP	5,021,000	DOWN	10,213,000
Residual stocks	43,386,000	DOWN	102,000	DOWN	12,282,000
Four-product stocks	395,319,000	UP	3,599,000	DOWN	15,297,000
Total imports	1,457,000	DOWN	173,900	UP	133,900

WHY SHOULD REFINERS run more crude in August than in January? The obvious answer is, they shouldn't. But they do. Take a look at the bars in the illustration.

The chart compares January and August runs for the 10-year period 1950 through 1959. Note that August runs topped January runs in 7 out of the 10 years.

Also, the 10-year average for August was 7,335,000 bbl. daily compared with 7,219,000 bbl. daily for January. For the full period, August runs have averaged 116,000 bbl. daily more than runs in January.

On the other hand, August demand has been much lower than demand in January. Total January demand averaged 9,299,000 bbl. daily for the past 10 years compared with 7,984,000 bbl. daily for August. Thus, August demand has been 1,315,000 bbl. daily under the average for January. The big winter-to-summer drops in demand have been in recent years. August was under January by 2,630,000 bbl. daily last year, 1,630,000 bbl. daily in 1958, and 2,650,000 in 1957.

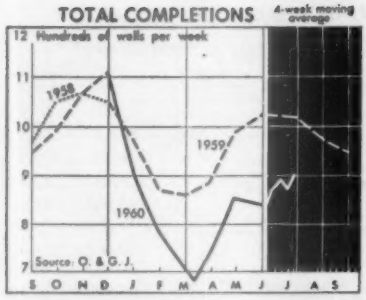
Unseasonal increases in runs during the month of August show up as abnormal gains in product stocks. For the past 4 years, refined product inventories have shown an average August increase of about 20.5 million barrels. And, there are five other months in the normal stock-increase period. Over the past 4 years, product stocks have gained an average of 83,000,000 bbl. in summer quarters.

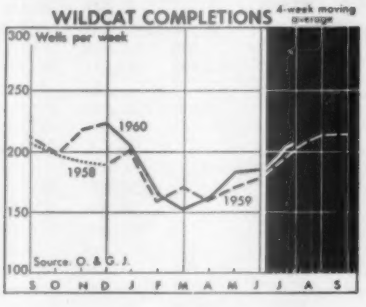
The greatest danger from high inventories lies in the potential pressure on product markets. In recent years and even in recent months refiners have seen the disastrous effect of distress sales on profits.

This danger from high product stocks should be of even greater concern to refiners because pressure on markets can't be measured objectively. Under certain conditions, 525,000,000 bbl. of refined products can cause a break in prices at the end of August. The same volume may not disturb the market the following year.

If a few refiners decide that stocks are high enough to break the market, they may start a dumping program that actually will create the break they have predicted. It will be too late then to cut runs.

Refinery runs are the craziest figures.





Active Rotary Rigs

	8-1-60	7-25-60	8-3-59
Alabama	4	3	9
Alaska	7	5	(†)
Arkansas	12	11	12
Arizona	1	0	1
California	78	90	90
Land	76	87	88
Offshore	2	3	2
Colorado	39	34	59
Florida	2	2	1
Land	2	2	0
Offshore	0	0	1
Illinois	40	43	44
Indiana	15	12	6
Iowa	0	0	2
Kansas	109	106	118
Kentucky	3	4	5
Louisiana	290	296	344
North	39	40	39
S. Inland waters	110	113	134
S. Land	82	81	115
Offshore	59	62	56
Maryland	1	1	0
Michigan	43	42	30
Mississippi	57	54	65
Missouri	1	1	0
Montana	20	21	30
Nebraska	25	26	26
Nevada	0	0	1
New Mexico	110	107	109
New York	0	0	1
North Dakota	13	15	28
Ohio	5	5	4
Oklahoma	150	160	223
Oregon	1	0	10
Pennsylvania	10	10	3
South Dakota	0	0	0
Texas	558	554	759
S. Inland waters	4	5	6
S. Land	162	164	184
Offshore	1	1	2
North	48	47	148
Panhandle	46	43	(*)
East	41	46	(*)
West Central	158	160	271
West	98	88	148
Utah	27	27	34
Washington	1	1	2
West Virginia	4	4	10
Wyoming	73	72	83
Total U. S.	1,699	1,706	2,109
Western Canada	180	185	150
Eastern Canada	1	1	0
Grand total	1,880	1,892	2,259

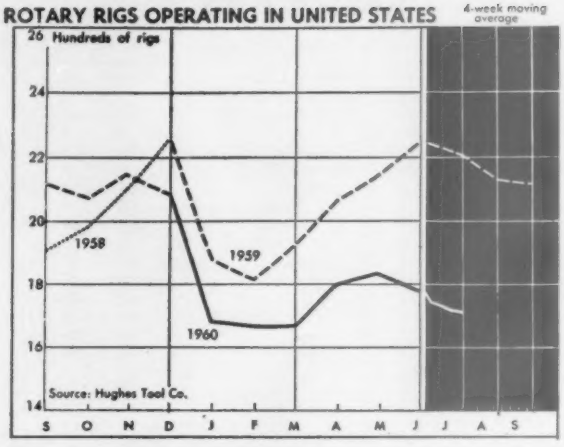
Hughes Tool Co. report. *Included in North. Comparisons not available due to change in method of reporting. †Data first reported 4-4-60.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED JULY 30, 1960

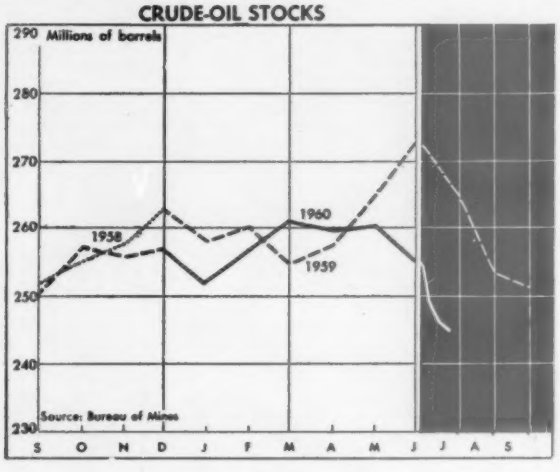
	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1960	1959	Total	Crude	Cond.	Gas	Dry	1960	1959
Alabama	0	0	0	0	0	0	0	28	57	0	0	0	0	0	1	13
Arizona	2	1	0	0	1	0	8,033	20	.....	1	1	0	0	0	16	.....
Arkansas	17	6	0	0	11	0	63,041	356	497	7	1	0	0	6	97	88
California	36	18	0	2	15	1	169,358	953	876	12	0	0	1	11	170	210
Colorado	11	1	0	1	9	0	42,907	356	435	7	1	0	0	6	175	259
Illinois	59	12	0	0	34	13	87,412	1,189	1,265	7	1	0	0	6	252	205
Indiana	17	10	0	0	6	1	22,495	543	467	6	2	0	0	4	209	156
Kansas	44	15	0	1	28	0	158,806	1,848	2,310	18	2	0	0	16	605	540
Kentucky	70	14	0	6	19	31	88,621	946	1,465	8	0	0	2	6	111	115
Louisiana	69	31	6	4	28	0	577,194	1,994	2,084	14	3	0	0	11	317	271
North	27	11	0	3	13	0	113,268	722	758	8	2	0	0	6	149	108
South	38	19	5	0	14	0	419,681	979	1,098	6	1	0	0	5	147	153
Offshore	4	1	1	1	1	0	44,245	293	228	0	0	0	0	0	21	10
Michigan	21	8	0	0	13	0	85,291	479	358	8	0	0	0	8	135	88
Mississippi	14	4	2	0	8	0	128,306	408	367	8	0	1	0	7	149	170
Montana	4	4	0	0	0	0	31,459	171	177	1	1	0	0	0	82	57
Nebraska	22	5	0	0	17	0	115,585	490	489	12	2	0	0	10	205	206
New Mexico	32	17	1	6	7	1	151,090	1,062	1,138	4	1	0	0	3	167	137
West	12	3	1	6	2	0	52,866	348	520	0	0	0	0	0	39	42
East	20	14	0	0	5	1	98,224	714	618	4	1	0	0	3	128	95
New York	0	0	0	0	0	0	0	187	169	0	0	0	0	0	26	13
North Dakota	7	3	0	0	4	0	39,602	176	302	3	0	0	0	3	46	60
Ohio	12	3	0	8	1	0	31,464	574	553	0	0	0	0	0	32	15
Oklahoma	135	72	2	16	40	5	546,835	2,329	3,390	20	6	0	3	11	442	493
Pennsylvania	0	0	0	0	0	0	0	377	323	0	0	0	0	0	8	9
South Dakota	0	0	0	0	0	0	0	17	.....	0	0	0	0	0	6	.....
Texas	280	123	14	20	114	9	1,216,968	9,201	11,162	61	3	1	2	55	1,904	2,084
Dist. 1	24	12	0	1	11	0	40,093	634	657	7	0	0	1	6	244	185
Dist. 2	12	2	2	3	5	0	74,687	439	477	2	0	0	0	2	106	138
Dist. 3	24	11	0	0	13	0	175,558	709	691	6	0	0	0	6	131	142
Dist. 4	22	3	1	4	13	1	124,412	621	770	9	1	1	0	7	179	188
East	21	11	3	0	7	0	103,118	732	692	3	0	0	0	3	154	137
Dist. 7-B	48	15	0	8	23	2	139,534	1,331	1,547	8	1	0	0	7	373	405
West	73	42	3	2	24	2	358,541	2,429	3,433	16	1	0	1	14	379	467
Dist. 9	40	20	0	0	16	4	121,515	1,706	2,108	10	0	0	0	10	299	357
Dist. 10	16	7	5	2	2	0	79,510	600	787	0	0	0	0	0	39	65
Utah	4	0	0	1	3	0	26,295	151	195	3	0	0	0	3	52	53
West Virginia	42	4	0	36	2	0	96,725	471	428	0	0	0	0	0	4	13
Wyoming	30	18	0	2	10	0	151,523	593	558	9	1	0	0	8	239	186
Misc. (Tenn.)	9	1	0	0	8	0	5,422	88	67	7	0	0	0	7	80	36
Total U. S.	937	370	25	103	378	61	3,844,432	25,007	29,132	216	25	2	8	181	5,530	5,477
Prev. week	807	338	32	68	333	36	3,304,002	.....	.....	220	16	4	5	195	.....	.....
Cum. 1960	25,007	11,603	758	2,069	9,797	780	108,450,740	.....	.....	5,530	489	62	182	4,797	.....	.....
Cum. 1959	29,132	14,776	716	2,102	10,747	791	120,364,707	.....	.....	5,477	528	77	163	4,709	.....	.....
Western Canada	82	41	0	12	20	9	399,179	1,251	1,421	17	2	0	5	10	349	429

PRODUCTION

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*
(Thousands of barrels)

	7-23-60	7-16-60	7-25-59
Pennsylvania	2,156	2,116	2,528
Other Appalachian	1,881	1,806	1,993
Illinois, Indiana, Michigan	9,300	9,743	9,508
Nebraska and North Dakota	2,922	2,923	2,916
Kansas	9,300	9,380	9,851
Oklahoma	17,210	17,853	17,053
Arkansas	1,923	1,999	2,060
Louisiana	17,535	17,632	19,443
North	2,886	2,863	3,152
South	14,649	14,769	16,291
Mississippi, Alabama, Florida	2,458	1,899	2,549
New Mexico	7,925	7,861	7,708
Texas	103,865	103,499	115,899
East Texas	8,157	8,023	9,204
West Texas	48,047	48,094	55,477
Texas Gulf	17,260	17,018	19,965
Other Texas	30,401	30,364	31,253
Wyoming	16,668	17,041	15,052
Other Rocky Mountain	9,916	9,846	9,714
California	28,120	28,382	31,889
Foreign	†13,737	13,937	16,569
Total	**244,916**	245,917	264,732

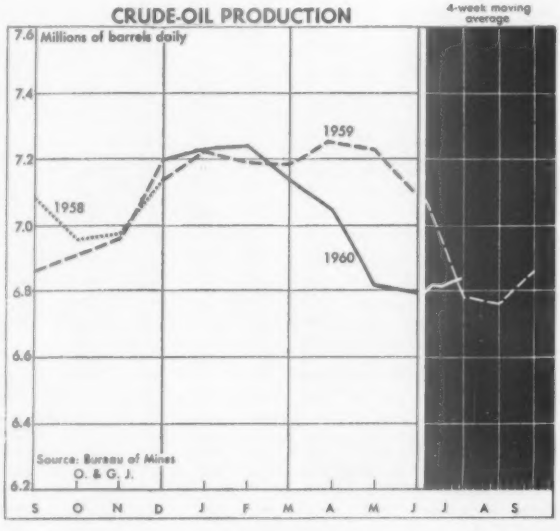
*Bureau of Mines. †Includes 3,364,000 bbl. in California.

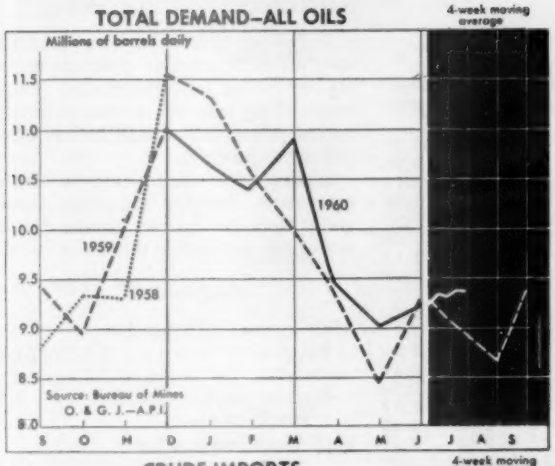
DAILY AVERAGE PRODUCTION FOR WEEK

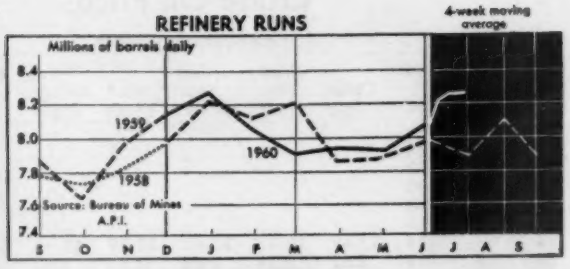
	July 30, 1960			July 23
	Crude oil	Lease condensate	Total	total
Alabama	15,975	.....	15,975	17,900
Arkansas	81,800	200	82,000	78,650
California	838,000	.....	838,000	837,900
Colorado	128,700	.....	128,700	127,000
Eastern	39,800	.....	39,800	40,200
Florida	1,000	.....	1,000	1,000
Illinois	219,600	.....	219,600	214,000
Indiana	33,100	.....	33,100	32,600
Kansas	†295,900	.....	†295,900	†302,415
Kentucky	63,400	.....	63,400	62,600
Louisiana	941,200	118,100	1,059,300	1,061,800
North	105,200	5,600	110,800	113,300
South	836,000	112,500	948,500	948,500
Michigan	41,500	.....	41,500	41,500
Mississippi	134,000	3,600	137,600	137,600
Montana	83,000	.....	83,000	82,200
Nebraska	66,800	.....	66,800	67,400
Nevada	100	.....	100	100
New Mexico	291,000	.....	291,000	291,000
North Dakota	59,400	.....	59,400	58,400
Oklahoma	†492,200	.....	†492,200	†519,200
Texas	2,349,000	85,800	2,434,800	2,434,800
Dist. 1	41,000	2,500	43,500	43,500
Dist. 2	97,000	8,100	105,100	105,100
Dist. 3	310,000	36,000	346,000	346,000
Dist. 4	161,000	17,000	178,000	178,000
Dist. 5	26,000	300	26,300	26,300
Dist. 6	101,000	8,900	109,900	109,900
East Texas field	122,000	.....	122,000	122,000
Dist. 7-B	126,000	150	126,150	126,150
Dist. 7-C	116,000	3,300	119,300	119,300
Dist. 8	949,000	7,000	956,000	956,000
Dist. 9	193,000	1,700	194,700	194,700
Dist. 10	107,000	850	107,850	107,850
Utah	93,700	.....	93,700	92,500
Wyoming	349,300	.....	349,300	344,600
Others	‡1,250	.....	‡1,250	‡1,350
Total U. S.	6,619,725	207,700	**6,827,425**	6,846,715
Change from prev. week, down	.....	.....	**19,290**	
Canada	†535,300	.....	†535,300	†531,000
Total U. S. Prod. Jan.1-July 30	.....	.....	1,485,992,200 bbl.	
Same period last year (crude plus cond.)	.....	.....	*1,505,764,000 bbl.	

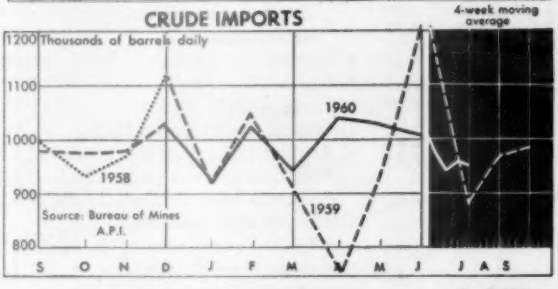
*Includes 39,895,250 bbl. condensate. †Week ended previous Monday. ‡Alaska and South Dakota.

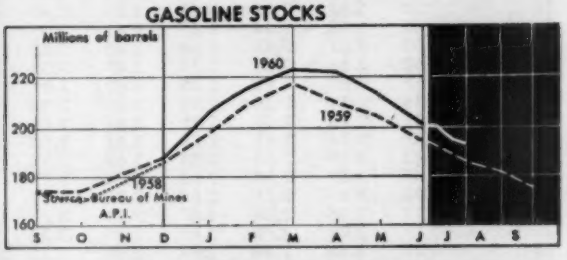
CRUDE-OIL PRODUCTION

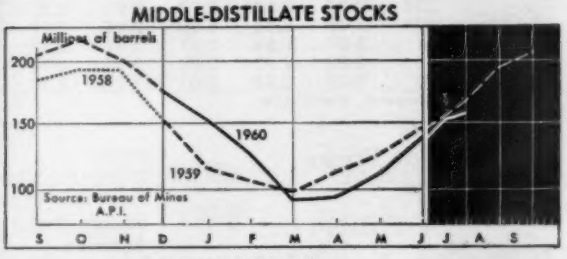


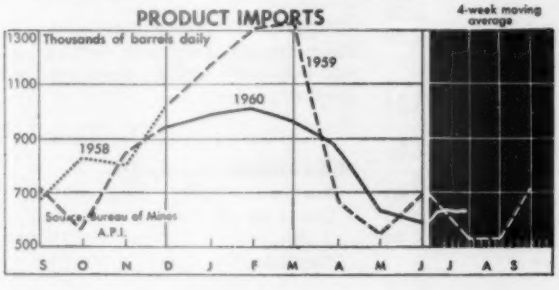


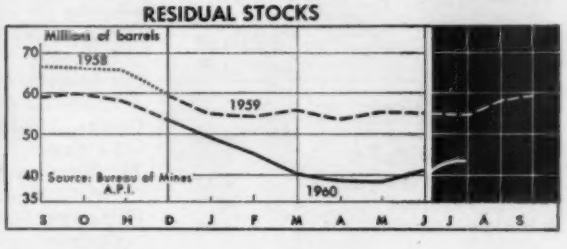












API REFINERY REPORT—JULY 29, 1960

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, July 1959: Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,177	532.0	39.3	322.1	133.1	44,457	11,309	45,621	12,007	1,101	522.0	13.3	325.6	160.0
Appalachian:														
District 1	89	37.1	2.6	17.9	7.7	6,005	715	3,004	431	92	40.8	3.0	21.5	4.2
District 2	109	53.7	5.7	20.0	10.1	2,977	344	1,211	243	107	59.5	1.1	20.5	8.3
Ind., Ill., Ky.	1,445	751.6	77.3	285.6	139.2	33,449	6,125	21,964	5,425	1,413	737.5	68.5	282.6	119.8
Minn., Wis., Dak.	127	60.3	3.7	33.9	15.7	6,798	1,361	6,005	528	115	55.5	7.7	26.5	11.1
Okla., Kans., Mo.	747	399.4	9.7	183.7	15.3	17,061	1,540	11,217	1,016	709	386.8	11.5	166.3	18.5
Inland Texas	311	231.9	9.1	53.0	20.4	6,498	570	1,580	2,494	294	229.6	6.6	49.3	24.8
Tex. Gulf Coast	1,966	1,017.4	112.6	451.8	125.1	24,552	3,531	14,053	4,369	1,737	914.2	56.5	405.9	127.8
La. Gulf Coast	678	352.6	61.7	160.8	43.9	10,052	1,890	5,955	1,465	712	395.2	47.2	166.2	44.7
N. La. and Ark.	104	62.6	5.9	16.3	6.9	5,494	700	2,260	149	69	28.5	1.8	14.0	4.2
Rocky Mountain:														
New Mexico	26	12.4	0.7	4.6	3.4	659	48	150	13	27	13.8	0.5	5.2	2.3
Other Rky. Mt.	316	141.0	4.7	63.0	40.1	5,847	375	2,552	816	327	144.8	3.1	67.3	35.1
West Coast	1,195	492.9	13.3	220.7	238.8	29,346	1,289	13,369	14,430	1,178	547.7	3.9	167.8	262.1
July 29, 1960	8,290	4,144.9	346.3	1,833.4	799.7	193,195	29,797	128,941	43,386	7,881	4,075.9	224.7	1,718.7	822.9
July 22, 1960	8,204	4,159.4	394.1	1,768.7	814.3	194,779	29,533	123,920	43,488	.....	.....	.....	.....	.....
July 31, 1959	7,997	4,135.4	242.7	1,720.9	939.0	186,496	29,298	139,154	55,668	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil Prices

GRAVITY SCHEDULE

	Signal Hill, Calif.	Oklahoma	West Tex. (sour)	West Tex. (Inter.)	No.* Texas	Texas Refugio Light	Bayou Sale (La.)	Denver Julesburg	Wyo. (sour)
14-14.9	$1.76	....	....	....	....	....	....	....	....
15-15.9	1.84	....	....	....	....	....	....	....	$1.81
16-16.9	1.92	....	....	....	....	....	....	....	1.86
17-17.9	2.00	....	....	....	....	....	....	....	1.91
18-18.9	2.08	....	....	....	....	....	....	....	1.96
19-19.9	2.16	....	....	....	....	....	....	....	2.01
20-20.9	2.24	$2.49	$2.35	$2.61	$2.29	$2.95	$2.90	$2.58	2.06
21-21.9	2.32	2.52	2.38	2.63	2.33	2.97	2.92	2.60	2.11
22-22.9	2.39	2.55	2.41	2.65	2.37	2.99	2.94	2.62	2.16
23-23.9	2.46	2.58	2.44	2.67	2.41	3.01	2.96	2.64	2.21
24-24.9	2.53	2.61	2.47	2.69	2.45	3.03	2.98	2.66	2.26
25-25.9	2.60	2.64	2.50	2.71	2.49	3.05	3.00	2.68	2.31
26-26.9	2.67	2.67	2.53	2.73	2.53	3.07	3.02	2.70	2.36
27-27.9	2.74	2.70	2.56	2.75	2.57	3.09	3.04	2.72	2.49
28-28.9	2.81	2.73	2.59	2.77	2.61	3.11	3.06	2.74	2.54
29-29.9	2.87	2.76	2.62	2.79	2.65	3.13	3.08	2.76	2.59
30-30.9	2.93	2.79	2.65	2.81	2.69	3.15	3.10	2.78	2.63
31-31.9	3.00	2.82	2.68	2.83	2.73	3.17	3.12	2.80	2.67
32-32.9	3.06	2.85	2.71	2.85	2.77	3.19	3.14	2.82	2.71
33-33.9	3.12	2.88	2.74	2.87	2.81	3.21	3.16	2.84	2.75
34-34.9	3.17	2.91	2.77	2.89	2.85	3.23	3.18	2.86	2.79
35-35.9	3.22	2.94	2.80	2.91	2.89	3.25	3.20	2.88	2.83
36-36.9	3.27	2.97	2.83	2.93	2.93	3.27	3.22	2.90	2.87
37-37.9	3.31	2.99	2.86	2.95	2.95	3.29	3.24	2.92	2.89
38-38.9	....	3.01	2.89	2.97	2.97	3.31	3.26	2.94	2.91
39-39.9	....	3.03	2.92	2.99	2.99	3.33	3.28	2.96	2.93
40-44.9	....	3.05	2.95	3.01	3.01	3.35	3.30	2.98	2.95

*Cooke, Grayson, Montague.

Flat Prices

Louisiana:
Sweet Lake $3.00

Texas:
East Texas 3.05-3.25
Conroe 3.23-3.53
Van 3.08

Pennsylvania Grade:
★ Bradford $4.75-4.80
Middle District 4.52
Southwest Pennsylvania 4.25
★ West Virginia 4.17
★ Buckeye Grade 4.08

Illinois Basin **2.85-3.00**

Foreign

Middle East, Persian Gulf (cargoes f.o.b. lifting port):
Arabian, about 34°, Ras Tanura $1.90
Iranian, 34.0°-34.9°, Bandar Masur 1.86
Iranian, 34.0°-34.9°, Abadan 1.81
Iraq, 36.0°-36.9°, Fao 1.82
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi 1.67
Qatar, about 41°, Um Said. 2.05

Middle East, E. Mediterranean:
Arabian, about 35°, Sidon.. 2.29
Iraq, about 35°, Tripoli, Banias (Grade A) 2.29

Far East (cargoes, f.o.b. Lutong, Sarawak):
Seria Light, 37° 2.57

Canada:
Leduc-Woodbend $2.53
Redwater (Alta.) 2.42
Smiley (Sask.) 2.18
Pembina 2.38

Venezuela:
Cumarebo, 47°-47.9°, Tucupido 3.34
San Joaquin, 40°-40.9°, Puerto La Cruz 3.08
Oficina, 35°-35.9°, Puerto La Cruz 2.80
Tia Juana medium, 26°-26.9°, Amuay* 2.30
Quiriquire, 16.0°-16.4°, Caripito 2.10
Lagunillas heavy, flat, Las Piedras* 2.10
Bachaquero, flat, 15°-16°, Las Piedras* 1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Tanker Rates (Long Ton)

(Latest reported spot fixtures)

★ Gulf-NY, clean (ATRS—5.0%) $2.71
★ Carib.-NY, dirty (ATRS—60.0%) 1.10
★ PG-UK, dirty (Scale—65.0%) (23s. 0d.) 3.22
★ Carib.-UK, dirty (Scale—55.0%) (14s. 8d.) 2.05

★Denotes change from previous week.

Refined-Product Prices

Following quotations are realistic spot prices for refined products moving interstate on Wednesday each week. They may differ from refiners' posted prices and should not be considered as postings.

Light-product prices are in cents per gallon. Residual and crude prices are dollars per barrel. Crude prices are at the well unless otherwise listed.

Gasoline*

Mid-Continent (Group 3):
Regular (91 octane).. 11.75-12.00
Premium (99 octane). 14.50-14.75
Natural gasoline (26-70) 4.5
Breckenridge 4.0

Gulf Coast (cargoes for coastwise or export movements):
★ Regular (90 octane) .. 11.00
★ Regular (92 octane) .. 11.25
★ Premium (98 octane) .. 12.25

California (rack) Los Angeles:
Regular (88 octane) .. 11.65-12.15
Premium (94 octane). 12.65-13.15
Premium (100 octane) 14.00-14.65

Caribbean area (cargoes):
Regular (87 octane).. 10.125-10.25
Premium (97 octane). 11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

Kerosine and Distillate

Mid-Continent (Group 3):
Kerosine 42-44 ..... 9.50-9.75
Diesel oil (58 d.i. and above) 9.25-9.50
Distillate No. 1 ..... 9.25-9.50
Distillate No. 2 ..... 8.25-8.50

Gulf Coast (cargoes):
Kerosine 41-43 ..... 9.00-9.25
Distillate No. 2 ..... 8.25

New York Harbor (barges):
Kerosine 41-43 ..... 10.05
Distillate No. 2 ..... 9.05
Diesel fuel, 48-52 d.i. 9.35

Caribbean area (cargoes):
Distillate No. 2 ..... 8.125

Residual Fuel (Bbl.)

Mid-Continent (Group 3):
Residual fuel (max. 1% S) $1.90

Gulf Coast (cargoes):
Bunker C fuel 2.35

New York Harbor (barges):
Bunker C fuel 2.52

Caribbean (cargoes):
Bunker C $2.10

California (rack):
Bunker C fuel, Los Angeles $2.15

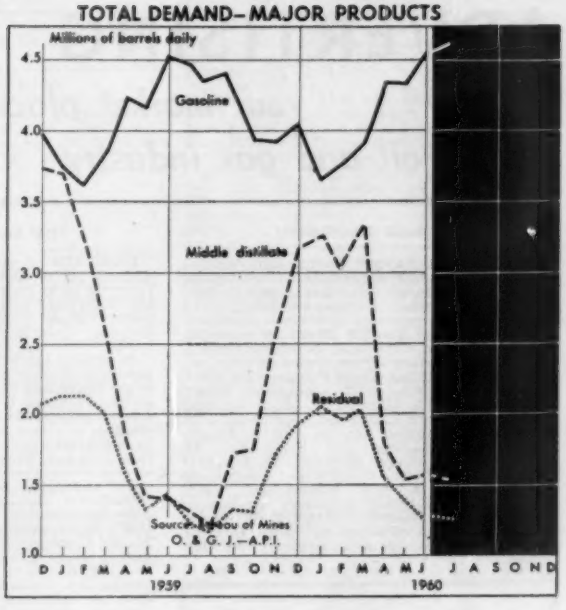
★Denotes change from previous week.

SUPPLY AND DEMAND—MAJOR PRODUCTS
(Thousands of barrels daily)

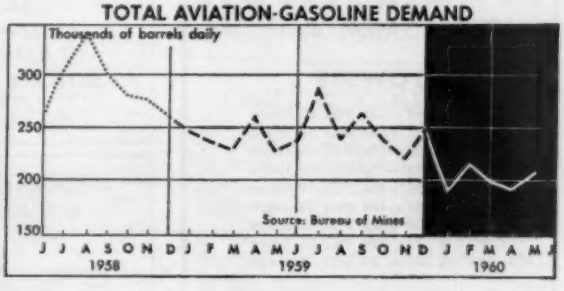
	Total demand	Refinery production	Stocks end of period†
GASOLINE			
July 1960*	4,620	4,245	192,800
June 1960*	4,550	4,190	201,700
May 1960	4,238	4,040	210,509
August 1950	4,331	4,205	181,921
July 1959	4,490	4,129	185,294
KEROSINE			
July 1960*	290	370	29,900
June 1960*	270	356	27,500
May 1960	202	318	24,217
August 1959	143	234	31,221
July 1959	197	225	28,328
DISTILLATE			
July 1960*	1,250	1,830	139,800
June 1960*	1,290	1,805	111,700
May 1960	1,304	1,737	95,461
August 1959	1,069	1,804	164,134
July 1959	1,131	1,719	140,388
RESIDUAL			
July 1960*	1,270	830	43,400
June 1960*	1,280	855	41,200
May 1960	1,346	841	39,628
August 1959	1,170	884	57,855
July 1959	1,232	823	54,509

*Preliminary. †Thousands of barrels.

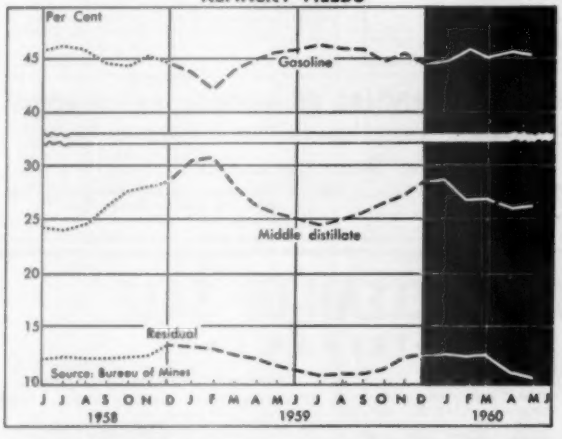
TOTAL DEMAND–MAJOR PRODUCTS



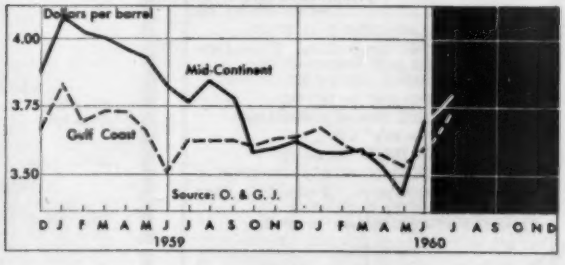
TOTAL AVIATION-GASOLINE DEMAND



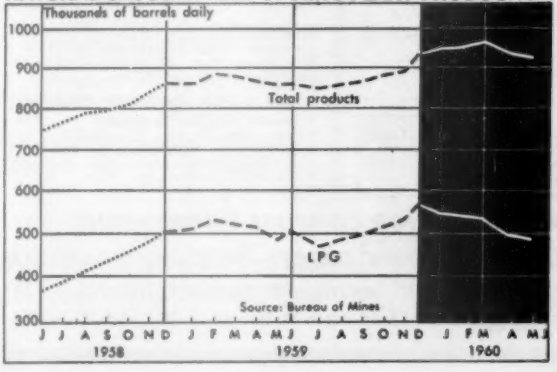
REFINERY YIELDS



REFINERY REALIZATION



NATURAL-GASOLINE AND CYCLING-PLANT PRODUCTION



REFINERY REALIZATION

	July*	June*	May	April
Mid-Continent	$3.79	$3.70	$3.46	$3.53
Gulf Coast	3.74	3.60	3.49	3.58

*Preliminary. Refinery realization is based on yields of major products and average spot prices of regular gasoline, kerosine, No. 2 fuel, and residual as published in The Oil and Gas Journal.

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REBUILT RA-3 Clark Compressor. Advise specifications your requirement: will quote suitably cylindered. Sperbeck Steel, Inc., Box 19351, Houston. Phone: HO-81317.

IDECO H-40-D Double Drum Drawworks, with Automatic Catheads, 22" Hydratarder, Right Angle Rotary Drive, two Control Consols and #525 Input Shaft Powered by GMC 6-71 #12107 Twin, with Complete Safety Shut Downs and Alarms, 96' Ideco 240,000# Hook-Load Kwik Lift Mast, complete with Guylines, Platforms, Lights, and Hydraulic System for Raising and Lowering. All Mounted on 8 Wheel Ideco H. D. Rambler Trailer. Excellent Condition. Priced at $30,000.00 F.O.B. our Bakersfield Yard. Balance of additional necessary equipment to complete if desired. Contact E. W. Clark, c/o Bender Oil Operations, P.O. Box 52, Bakersfield, California. Telephone FAirview 4-4961.

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10'	x 145'—	125 PSI	50 trays
9'6"	x 121'—	325 PSI	30 trays
8'6"	x 103'—	165 PSI	24 trays
7'0"	x 82'—	75 PSI	30 trays
6'0"	x 80'—	300 PSI	30 trays
4'0"	x 44'—	150 PSI	12 trays
3'6"	x 36'—	400 PSI	12 trays
2'6"	x 52'—	360 PSI	22 trays
2'2"	x 57'—	85 PSI	4 trays

HEAT EXCHANGERS—CONDENSERS

Steel Tube	7,500 to 100 sq. ft.
Adm. Tube	3,500 to 236 sq. ft.
Cu Ni Tube	2,330 to 308 sq. ft.
S. S. Tube	1,000 to 170 sq. ft.

BLOWERS—11,880 CFM @ 11 PSIG
INSTRUMENTS—Controllers, Recorders, Indicating and Transmitting
MOTORS—10 HP to 500 HP XP
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REACTOR—8' x 32'6" OA
REBOILERS—2,700 to 450 sq. ft.
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VALVES—Diaphragm, Butterfly Slide and Pressure Regulating
VESSELS PRESSURE—3' to 12' Dia.

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1.9 MILLION BTU NEW 1949

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BARGAIN: Franks double drum portable drilling rig w/200,000# capacity 90' derrick, 7¼ x 12 G D Pump and all necessary tools for complete rotary rig inventory on request. Miers Well Service Inc., Box 325, Sterling, Colorado.

62 MILES OF 6-inch pipeline with booster pumping station sites and recorded rights of way, extending from Philadelphia refining area to a point 7 miles north of Lancaster, Pennsylvania. 44 miles are presently in product use and remainder can be returned to use after repairs. Box L-913, The Oil and Gas Journal, Tulsa, Oklahoma.

127' LEE C. MOORE Cantilever Mast, Model No. 2785, API capacity of 450,000#, Mast top size 4'0" x 4'6". Leg spread at base, 15'0"; Mast shoe plates and pins are with Mast. Sheaves and shafts have been removed from Crown Block and there is no racking platform. Can be seen in Pampa, Texas, by contacting Herbert James, Box 2042, or telephone MOhawk 4-6610. Selling because of need for larger Mast for deeper drilling.

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Portable Prefabricated
BAILEY BRIDGE
RENTALS & EQUIPMENT
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air-water combination mounted on 1955 R185 International truck. Also includes water truck with 700-gallon tank. Call or write:
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Phone: FLeetwood 2-2671.

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400 HP Compressors; Towers; Vessels; Heat Exchangers; Pumps.

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OR

Louisiana Steel Compress Co.
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Phone DI 8-5371

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DESTREHAN, LA.

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Steel Tube: 3280, 2100, 1200, 950 sq. ft.
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20 Fin Tubes: 50-190 sq. ft.

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8' x 75' 20 Tray 25#	4' x 36' packed 210#
7½' x 56' 20 Tray 35#	10' x 55' 60#
36' x 58' 30 Tray 154#	8' x 43' 60#
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1—Clark Centrifugal Compressor 10,000 CFM—240 PSI discharge.

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Hot Oil: 1" through 6"; 50-400 gpm 100-3,000 ft. hd.
Boiler Feed: 190 gpm 1,500' hd.
Cooling Tower: 7,000 gpm 120' hd.
River Water Sump: 1,000 gpm 59' hd.
Deep Well: 1,700 gpm 90' hd.

OTHER FEATURED ITEMS

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2 Petro-Chem. Furnace: 1¼ mil. BTU
2 B&W Boilers: 70,000# per hr.-450#
1 IR-XVG-4 Compressor
1 Worth LT-6 Compressor
1 Ethyl Lead Plant

WIRE!—PHONE! FOR COMPLETE INFORMATION

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4101 San Jacinto St. Houston 4, Texas, JA 6-1351
35-65 Jabez St. Newark 5, N. J., MA 3-7420

FOR SALE EQUIPMENT

TWO PERFORATING trucks with lines completely equipped with or without radioactivity logging equipment. These trucks are in excellent condition and ready for immediate use. Box L-897, The Oil and Gas Journal, Tulsa, Oklahoma.

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3—INTERNATIONAL K11 tandem trucks equipped with triplex HP acid pumps, tanks, flexible hose and connections. These pumpers excellent for many lease service operations. Selling price based on salvage value, $5000.00 and up. Terms or lease purchase for qualifying buyers. Write or call C. D. Core, P. O. Box 47, Phone FR 9-5132, Seguin, Texas.

NEAR NEW National 110 Rig with three PTDS-8 Engines, Gyrol Drive, "Runaround" Rotary Drive, two taildriven G-700 National Pumps, C-250 Pump with GMC-Power, 142' L. C. Moore 1,025,000# Mast, National "F" Hook-Block #654F450, National N-815 Swivel, National MS-27½ Table, M-D Recording Indicator with Sensator and Torque Gauge, Six Bender Drill Pipe Bins and Racks, Casing Racks, 28 Drill Collars, one 410 Bbl. Storage Tank, two 35 KW Generators, Utility House with Panel with C-H "Arc-Tite" Connections. Shop with 5,000 gallon Diesel Tank Mounted Topside, Tool House 20' x 7'6" x 10' Skid Mounted, 7'6" x 7'6" x 7'6" Drillers House, Totco, Casing Tools, Misc. Tools, etc. Rig located at Southeastern U. S. Port on Dock. Six months total use. Drilled three wells since new. Excellent Condition and Priced to Sell. Contact E. W. Clark, c/o Bender Oil Operations, P. O. Box 52, Bakersfield, California. Telephone FAirview 4-4961.

RIG, TRACTORS, crane for sale: 60 Keystone same as new, spool 5,000 feet drilling line, hitch for moving has 4,500 ft. new line. D-7 Caterpillar with oil field winch and blade, excellent. TD-14 International tractor, oil field winch and blade Lorain Motor crane, clam bucket with Auto Car 10 wheel drive truck, excellent. Truck winch with power takeoff. All items priced for immediate sale. Harold Hardwick, Burnside, Ky.

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$150.00 FOR 20" Spider with slips only—Near Tulsa, GI 7-4750, 309 Thompson Bldg., Tulsa, Oklahoma.

EQUIPMENT WANTED

WE ARE interested in the purchase of your depleted wells for salvage. Also, used casing, tubing, units, tanks, etc. Must be in Kansas area. The Buckeye Supply Company of Kansas, Inc., 105 S. Main, El Dorado, Kansas.

WANTED—One vertical G B Superior 100 horse power cylinder gas engine. Box 7095, Tulsa.

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DRILLING—Wyoming, small amount money needed to complete hole, good deal. Write Box 236, Logan, Utah.

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MEXICAN RANCHES—Two 20,000 acre ranches west of Saltillo, Coahuila State, about 150 miles from border. Good title, $3.50 per acre, suitable for cattle or recreation. Box L-895, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION WANTED

PRODUCING PROPERTIES: Highest price paid for producing properties, including stripper production. Tex-Gas-Oil Investment Co., Inc. 601 Meadows Building, Dallas, Texas, Phone: Em 3-1693.

WANTED TO BUY: Producing or non-producing minerals and/or ORRs in the San Juan Basin, NW N. Mex. Box L-936, The Oil & Gas Journal, Tulsa, Oklahoma.

BUSINESS SERVICE

DELAWARE CORPORATIONS formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware.

LEASE AND DRILLING BLOCKS

TWO TEXAS oil leases available: Crane County, S/239 acres, Section 18, block B-28, PSL; Upton County, all section 6, block 2½, TC RR survey, 77 acres; bonus priced $10.00 per acre, with $1.00 per acre annual delay rental, five years primary term leases, subject to my confirmation. Quickly write landowner: Jefferson G. Smith, 715 Littlefield Building, Austin 15, Texas.

FOR SALE—304 acre government lease T. 5 S. R. 11 W. Cotton Co. Okla. Cash and override. Box L-924, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEATHAM COUNTY, Tennessee: 3,000 acre block, geologic structure on producing trend, geologist has mapped surface, report available; 60 cents per acre, ½ override, Box 2493. Salt Lake City, Utah.

382 ACRE LEASE western Irion County, Texas. ⅞ mile from San Andres production and 6 miles of 15 million barrel field. Expires January 1965. Good geology. Northwest ¼ survey 54 Washington Co. Ry. and east 222 acres survey 8 E. L. Rucker. $10.00 per acre or will make drilling deal. Roscoe Simpson, 12 South Irving St., San Angelo, Texas, Phone 3230.

SETTLED OIL PRODUCTION, 2 producing wells and SWD, drilled in 1925 making 10 BOPD, 6 miles from Tulsa, $18,000. Lease 3 miles from El Dorado, Kansas, 2 wells and SWD drilled in 1948 making 7 BOPD, $12,000. W. D. Short, Oxford, Kansas. Phone 120.

WILL BEGIN DRILLING on 80 acres, Montgomery County, Kansas, offsetting heavy production. Need additional capital. All funds escrowed. For information please write: S. & M. Drilling & Production Co., P. O. Box 98, Cherryvale, Kansas.

FOR SALE—working interest in 160 acres offset to nice Bartlesville Sand, well 750 ft. Eastern Kansas. Box L-902, The Oil and Gas Journal, Tulsa, Oklahoma.

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HELP WANTED

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NEW OIL JOB Directory, foreign and domestic, showing where to apply for jobs. 500 selected producing, refining, butane and pipeline companies. Nationwide, $5.00 cash. OIML Co., Box 2603, Tulsa, Oklahoma.

EXPLOITATION GEOLOGIST with proved reservoir engineering experience. Job location in Libya with company already owning proved reserves. Minimum five years experience, previous foreign experience desirable. Box L-927, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER: At least 6-years experience in Illinois, Indiana, and Kentucky areas. Executive experience not necessary but desirable. Good starting salary. Future raises commensurate with ability. Reply strictly confidential. Box L-937, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER with field production experience wanted to manage as substantial owner of operating company, oil and gas leases in Kansas. Wonderful opportunity for qualified man, with lifetime future. Should have excellent references with actual field experience as well as management ability to supervise. Prefer man with experience in Kansas production. Age no factor, but prefer man from 35 to 45 years of age. Write full resume in first letter; all replies held confidential. Apply by letter to: Box L-944, The Oil and Gas Journal, Tulsa, Oklahoma.

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Experienced in all phases I.C.C. pipeline accounting and reports, for small newly organized products pipeline company. Write full particulars, experience, qualifications, and salary expected to:

Mr. Sibole,
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326 National Bank of Tulsa Building
Tulsa, Oklahoma.

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Operations Research

To head group working on linear programing of refinery operation and transportation for multi-refinery company, mid-west location. Should have experience in linear programing and operations research, be well grounded in refinery technology.

Salary commensurate with experience and background. All inquiries will be held confidential.

Send resume, salary requirements to:
BOX L-940
THE OIL AND GAS JOURNAL
TULSA, OKLAHOMA

HELP WANTED

NATURAL GASOLINE PLANT ENGINEER

Oil Company has immediate need for a qualified man with chemical and/or mechanical engineering degree. Require at least five years experience in all phases of natural gasoline plant operation and treatment of sour gas. Duties involve general plant engineering including laboratory control testing, plant performance tests, plant maintenance, and process trouble-shooting. All inquiries held confidential. Please send resume of background and experience to Box L-818, The Oil and Gas Journal, Tulsa, Oklahoma.

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ELECTRONIC INSTRUMENT DESIGN
College Degree Required
Salary commensurate with ability and experience.

General Geophysical Co.
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BOX L-932, The Oil and Gas Journal
Tulsa, Oklahoma

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EMPLOYMENT DEPARTMENT
P. O. BOX 2511, HOUSTON 1, TEXAS
(All replies will be held in confidence)

HELP WANTED

PETROLEUM ENGINEER—with production experience and sales ability, wanted by Houston Production Equipment Manufacturer. Box L-892, The Oil and Gas Journal, Tulsa 1, Oklahoma.

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Assistant Drilling Superintendent

Substantial Foreign Contracting Operation

Practical drilling experience in direct field supervisory capacity mandatory; graduate engineer preferred. Foreign experience not essential.

This is a job with a future for a man with ability and the capacity for top responsibility and growth.

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Box L-943
The Oil and Gas Journal
Tulsa, Oklahoma

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PROCESS ENGINEER WANTED by national manufacturing concern to locate in Tulsa area. Engineering degree required. Should be experienced in gas, gasoline plant layout. Write stating qualifications, experience, salary desired, etc. Box L-915, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

EXPERIENCED GEOLOGIST. Desires to represent active independent on retainer or salary in Ark., La., Tex., area. Over 9 years well rounded major company experience. Hard worker. Resume furnished. Available now. Box L-922, The Oil and Gas Journal, Tulsa, Oklahoma.

AIRLINE CAPTAIN, 12,000 accident free hours. Capable of inaugurating and/or operating aviation division. Desire job in Middle East or South America. 5 years in Middle East. Capable of fulfilling any aeronautical logistics need. Presently employed by large international airline. Box L-931, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION SUPT. Petroleum Engr. Desires position either category. 17 years experience all phases drilling, producing operations both Major and Independents. Registered. Box L-941, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST—Six years major company experience in all phases of exploration. Thorough knowledge of stratigraphy, structure, and productive trends in Southeastern states. Box L-934, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST-PILOT—Interested in employment with small oil company, or independent operator who needs versatile man. Two years experience with major company. Formal education also includes business background. Former military instructor pilot. Commercial license for multi and single engine aircraft. Instrument card. Experienced in personnel, administrative, and sales work. Early thirties, married. Brochure on request. Box L-933, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST: 41, American, B.S. Mining Engineering. 19 years experience—16 years foreign work in Venezuela and Colombia. 9½ years administrative experience in Geophysical-Geological co-ordination with major independent. At present consulting. Seeking assignment in foreign work, preferably Central or South America. Will consider permanent position with future potential. Complete resume and references upon request. Apartado 4777 del Este, Caracas, Venezuela.

DRILLING ENGINEER—Toolpusher; age 29, BS degree, thoroughly experienced in all phases of a drilling operation, 6 years experience from roughneck to drilling engineer—Toolpusher on big rigs. Both land, marine and offshore. Resume on request. Box L-938, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST-PALEONTOLOGIST

B.S. degree in Geology, 20 years major and independent oil company experience in geology in the U. S. Mid-Continent, California, South America, and the Middle East, familiar with micropaleostratigraphy, depositional environments, well correlations by lithology, foraminifera, ostracoda, pollen and spores, residues, all types of well logs, geologic and magnetic surveys, ideas for drilling wells, wants retainer.

216 Knox Building Enid, Oklahoma

The OIL AND GAS JOURNAL
Box 1260
TULSA, OKLAHOMA

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LOCATOR of ancient buried Spanish Peralta mines Superstition Mountains, Arizona, including famous Lost Dutchman mine, solicits mining engineering and finance to re-open and mine on large scale. Q. T. Cox, 1216 West 226th Street, Torrance, California FA 0-0369.

LEGAL

SALE OF OIL AND GAS MINING LEASES TRIBAL AND ALLOTTED INDIAN LANDS DEPARTMENT OF THE INTERIOR BLACKFEET INDIAN AGENCY BROWNING, MONTANA. Sealed bids will be received until 10:00 A.M., Mountain Standard Time, August 24, 1960 and opened at that time in the Auditorium of the High School, Browning, Montana, for the leasing of 47,639.83 acres of Tribal land and 14,131.67 acres of Allotted land located in Township 30 North, Range 11 West; Township 31 North, Ranges 6, 11, & 12 West; Township 32 North, Ranges 6, & 12 West; Township 33 North, Range 6 West; Township 35 North, Ranges 6, 7, West; Township 36 North, Ranges 8, 9, 10 & 14 West; Township 37 North, Ranges 9, 10, & 14 West, in Glacier and Pondera Counties for oil and gas mining purposes. The details of the lease offering and how and where to file bids may be obtained by addressing an inquiry to the Superintendent of the Blackfeet Indian Agency, Browning, Montana.

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please be sure to let us know promptly. It takes time to correct the stencil addressing plate. And we don't want you to miss copies of THE JOURNAL.

Also . . . . . .

be sure to give us both

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(including company)
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The Oil and Gas Journal

Box 1260 Tulsa, Okla.

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TULSA, OKLAHOMA

MISSION LIGHTWEIGHT SLIPS BUILT LIKE A BRIDGE FOR STRENGTH AND LIGHTNESS

MODEL 60

Mission Slips in 600,000 lbs. capacity slip test machine, with fourteen channel recording oscillograph measuring strains in slips and pipe.

Field and laboratory tests proved that these slips are built like a bridge with plenty of strength but no excess weight. They weigh only 135 pounds; so you won't break your back setting them. Yet, they have all the heavy-duty features you will ever need. You can hold drill pipe with hook loads of 275,000 lb. and drill pipe sizes 2⅜" through 5". The lightweight results from a new design based on sound and proved engineering principles.

Mission Rolling Dog teeth grip the hardest pipe available today with minimum stress concentration. New positive lock retains dogs in place. The standard rolling dogs and new solid inserts let these slips do the job of the heavyweights. You will find all the proved and popular Mission slip features: Segments are self-leveling as insurance against crimping the pipe. Top of slips is constructed to allow heavy elevator blows to be absorbed. Renewable hinge pins on these Lightweight Slips mean long life, less replacement. Flexible handles bend instead of break.

These new slips — built like a bridge — are one more proof Mission knows drilling problems and knows how to overcome them. Available at your supply store.

For over thirty years - quality built in to last **MISSION** MANUFACTURING CO

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Pistons • Piston Rods • Slips • Gland Packings • Liners • Liner Packing • Pump Valves and Seats • Swabs • Valves • Hammerdrils • Centrifugal Pumps

It's not what you pay for a bit... it's what the bit does in the hole that determines its value to you!

That's why Hughes bits are engineered for performance! Why we devote so much time in laboratory and field research to find ways to improve penetration rate and extend bit life. And why an increasing number of our engineers are being assigned to the field to study bit performance from the vantage point of the rig floor.

In developing new bit designs and improving old ones, Hughes engineers draw on the world's greatest rock bit experience, and on facts obtained in the drilling of hundreds of thousands of wells.

This experience and continuing research *work for you* with every turn of the drillstem!

HUGHES TOOL COMPANY ORIGINATOR AND WORLD'S LEADING DEVELOPER OF CONE-TYPE ROCK BITS